

Exhibit “A”

Part 1 of 5

EXPERT REPORT

Agere Systems Inc., et al. v. Advanced
Environmental Technology
Corporation et al.,
U.S.E.D. Pa. Civil Action No. 02-3830

Prepared by:

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Prepared for:

Advanced Environmental Technology Corp.
Ashland Inc.
Carpenter Technology Corporation
fcg, Inc.
Handy & Harman Tube Company
NRM Investment Company
Techalloy Company, Inc/Rahns Specialty Metals
Thomas & Betts

September 29, 2006

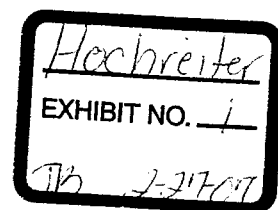


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LIST OF ACRONYMS

AETC	Advanced Environmental Technology Corporation
AOC	Area of Concern
BHC	Boarhead Corporation
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
COC	Constituent of Concern
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
DPA	Diphenylamine
FS	Feasibility Study
HRS	Hazard Ranking System
MBT	Mercapto Benzo Thiazole
MEK	Methyl Ethyl Ketone
NADC	Naval Air Development Center, Warminster PA
NJDEP	New Jersey Department of Environmental Protection
NPL	National Priority List
OU	Operable Unit
PADER	Pennsylvania Department of Environmental Resources
PO	Purchase Order
PRAP	Proposed Remedial Action Plan
PSA	Preliminary Site Assessment
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RIR	Remedial Investigation Report
ROD	Record of Decision

SI	Site Inspection - or- Site Investigation
SEC	Senior Environmental Consulting, LLC
SPS	Standard Pressed Steel
TCE	Trichloroethene
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

1. Introduction

My name is Joseph J. Hochreiter, Jr. I have been retained by eight defendants involved in the litigation relating to the Boarhead Farms Superfund site to review technical documents, correspondence, depositions and other documents related to the Plaintiffs and Settled Defendants in the legal matter captioned:

AGERE SYSTEMS, INC. ET. AL. v. ADVANCED ENVIRONMENTAL TECHNOLOGY CORPORATION, ET. AL., U.S.E.D. Pa. Civil Action No. 02-3830.

This report covers information gathered and reviewed regarding the following five Plaintiffs and nine Settled Defendants. The Plaintiffs are as follows:

- American Cyanamid Company (Cytex Industries, Inc.);
- National Rolling Mills (TI Group Automotive Systems,);
- Philco Ford (Ford Motor Company);
- Standard Pressed Steel (SPS Technologies, LLC); and
- Western Electric (Agere Systems)

The nine Settled Defendants are:

- Bostik South (Crown Metro/Emhart);
- Ciba-Geigy (Novartis);
- Knoll International, Inc.;
- Plymouth Tube Company;
- Quickline Design and Manufacturing Company;
- Rohm & Haas Company;
- Simon Wrecking;
- Sperry Burroughs (Unisys Corporation); and
- United States Department of the Navy.

Throughout this report, the five plaintiffs and nine settled defendants are collectively referred to as the Plaintiffs and Settled Defendants.

1.1 Report Objectives

For historical operations and waste generation practices occurring during the period of 1969 through 1977, when DeRewal Chemical, Inc. was in operation and the Boarhead Farms site was alleged to have been in use for waste disposal, I have been asked to review and summarize available information related to each of the fourteen Plaintiff and Settled Defendants' manufacturing processes along with the volume, form and nature of the resulting wastes generated by those processes.

My comments and opinions are based on my review of the aforementioned materials, as well as my personal experience, knowledge, and training.

A complete list of the documents considered to arrive at the conclusions and opinions presented in this report is listed at the end of this report. The information and facts provided as well as any opinions expressed in this report are based upon data and documentation made available to me as of September 27, 2006. As

new/additional data and/or records become available, I reserve the right to modify the information presented, as well as any opinions and conclusions expressed herein, as appropriate.

1.2 Qualifications

I am a hydrogeologist and a Certified Ground Water Professional (#114088, expiration 12/31/09) with over 30 years of experience in the investigation and remediation of environmental contamination. From 1973 to 1979, I worked as a hydrologic technician at the New Jersey District of the U. S. Geological Survey, Water Resources Division. In this capacity, I collected environmental samples, performed analyses, and established a water-quality laboratory for the District. From 1979 to 1987, I was a hydrologist in that same office, responsible for designing and implementing scientific research into the water resources of the State of New Jersey. From 1987 to present, I have worked as an environmental consultant. From 1988 to 1992, I was a scientist, then Principal at ERM, Inc. in Princeton, New Jersey. From 1992 to 2005, I was a Vice President with the firm of Blasland, Bouck & Lee, Inc., (BBL) where I managed the firm's Philadelphia-area office. In 2005, I retired from BBL and formed my own company, Senior Environmental Consulting, LLC (SEC), where I am currently employed as Principal Scientist.

My professional experience directly relates to the execution of Remedial Investigations (RIs) and Feasibility Studies (FSs) at contaminated sites. During my tenure at the U.S. Geological Survey, I conducted several regional aquifer and river system studies to assess the impacts of volatile-organic-compound and metals contamination on environmental quality. I have managed and/or directed the investigation of over 50 contaminated sites as an environmental consultant, including many Superfund and similarly complex sites.

I have participated in the investigation and/or remediation activities for competitively bid projects at six Superfund sites (JIS Landfill in Jamesburg NJ; Evor Philips site in Old Bridge NJ; KOP site in Winslow, NJ; Ewan Property Site in Shamong Township, NJ; the Rolling Knolls Site in Chatham, NJ, and the Chemical Control Site in Elizabeth NJ). I have also directed the investigation of numerous non-NPL sites, including many voluntary cleanup sites, RCRA Corrective Action facilities, and brownfields redevelopment projects. At all of the above-referenced sites, the contaminants of concern involved organic and inorganic substances that are similar to those identified at the Boarhead Farms site.

My professional resume and bibliography are included herein as Appendix A. While I have prepared an expert report in another matter during the past year, I have not testified as an expert at trial or by deposition in any other cases within the preceding four years.

Senior Environmental Consulting, LLC (SEC) is being compensated for my services at a rate of \$185.00/hour. My services, and those of a research assistant, include: document review, site and facility records research, data evaluation and analysis, and report preparation. Additional support services, including deposition and trial testimony, will be provided by me at the same \$185.00/hour rate.

1.3 Report Organization

Section 2.0 provides background information concerning the Boarhead Farms property Superfund Site history and a description of the methodologies used herein to quantify waste volumes for each Plaintiff and Settled Defendant.

Sections 3.0 and 4.0 provide a summary of historical operations, manufacturing processes, and historical wastes generated by each of the five Plaintiff parties, and each of the nine Settled Defendant parties, respectively. Those report sections provide two categories of information for each subject company: a narrative summary of historical manufacturing processes, products and wastes generated during the Period of Interest; and a tabulated

summary of documented (actual) quantities of wastes generated, where data were available. The detailed summary tables compiled for each of the Plaintiffs and Settled Defendants are provided in Appendix B.

Section 5.0 provides a summary of SEC's opinions and conclusions.

Section 6.0 is the list of documents considered by SEC.

2. Boarhead Farms Superfund Site: Background

2.1 Boarhead Farms - Superfund Site History

The Boarhead Farms site is located on Lonely Cottage Road, in Upper Black Eddy, Bridgeton Township, Bucks County, Pennsylvania, and consists of approximately 113 acres of wooded and non-wooded wetlands, wooded uplands, and open field areas, which include four ponds. The Boarhead Farms land was used as a horse farm prior to October 1969. Boarhead Corporation (BHC) was incorporated in September 1969 by Manfred T. DeRewal, Sr. (Manfred DeRewal) and reportedly was created for the sole purpose of real estate ownership (M. DeRewal deposition, 2003, p. 18). BHC purchased the land known as Boarhead Farms from private owners on October 16, 1989 (USEPA, 1998b, Plaintiffs Exhibits P-5, P-6). The property was reportedly heavily wooded prior to 1969 (USEPA, 1998b). Manfred DeRewal also owned and was president of DeRewal Chemical Company, which housed its offices and equipment and conducted some or all of its business operations on the Boarhead Farms property from approximately late 1969 to mid-1977, at which time DeRewal Chemical Co. reportedly ceased to do business.

The USEPA conducted a Site Inspection (SI) of Boarhead Farms in May 1984 and issued a final SI Report in January 1986 (USEPA, 1998b). The USEPA's Hazardous Ranking System (HRS) report was issued in September 1987, with the site scored at 39.9. The USEPA placed the Site on the National Priorities List (NPL) on March 31, 1989. USEPA describes the Site as the target of widespread illegal dumping of hazardous substances from 1969 until sometime in the late 1970s, with contaminants found in the groundwater, in the surface and subsurface soils, and buried in various locations in both metal drums and unconsolidated forms (USEPA, 1998a).

USEPA concluded that "Illegal dumping has occurred on the Site since the property was purchased by Mr. DeRewal and BHC. There have been numerous reports and findings of spills, fish kills, and offensive odors emanating from the Site", based on reports of investigations by the Bucks County Department of Health (BCDOH), the Pennsylvania State Police, and the Pennsylvania Department of Environmental Resources (PADER). USEPA also noted that "Notes and formal memoranda from those inspections indicate that tank trucks, vats, barrels, and other containers containing hazardous substances were stored at the Site. Inspection reports from the 1970s refer to drum burial, releases of hazardous wastes and the presence of lagoons and other standing liquids. Many of the objects and conditions noted in the county and state inspections were confirmed by aerial photographs of the Site in the 1970s". (USEPA, 1998a).

USEPA's Remedial Investigation (RI) and Feasibility Study (FS) were completed in 1997. The RI concluded that large scale dumping of bulk hazardous wastes and drummed materials as well as burial of hazardous substances had taken place in various locations across the Site (USEPA, 1988a). The Proposed Plan and Record of Decision (ROD) were both issued in 1998 (USEPA, 1998b).

Extensive site cleanup activities took place at the Boarhead Farms site during the period from 1992 through 2003. USEPA conducted two drum removal actions in 1992 and 1993, respectively, with over 2500 drums located, excavated, and disposed of off-site (USEPA, 1998b). General Ceramics, Inc, pursuant to an Administrative Consent Order dated December 1992, performed another removal action to remove drums and soil contaminated with radioactive and other wastes (USEPA, 1998b). In addition, a groundwater interception trench, approximately 1300 feet in length, was installed to collect contaminated groundwater for treatment in an on-site treatment facility (USEPA, 1998b). In January 1997, approximately 18 residences were supplied with carbon filters for their drinking water wells (USEPA, 2004). During 2003, another drum and soil excavation was conducted, resulting in an estimated total of 20,529 cubic yards of material, which included intact and crushed drums, excavated from 26 areas. Of that total, approximately 2,215 tons of hazardous waste material and 1,877

tons of non-hazardous wastes were disposed off-site, with the remainder used as on-site backfill (TetraTech/Black & Veatch, 2004). As of January 2004, USEPA indicates that the treatment facility was in operation and scheduled for upgrades to improve VOC treatment and heavy metals removal (USEPA, 2004).

2.2 Quantification of Plaintiff and Settled Defendants Wastes

In order to determine or estimate the quantity of waste substances generated by each of the Plaintiffs and Settled Defendants during the relevant timeframe of 1969-1977, the following methodology was applied:

1. The time span of 1969 to 1977 was rounded to 8 years of duration, based on a late 1969 start of potential operations at Boarhead Farms (the property was purchased by M. DeRewal in October 1969) and a mid-to late-1977 cessation of operations at Boarhead Farms (no absolute date for an end to site operations was found in any of the materials considered by SEC). This timeframe is hereafter referred to throughout this report as the "Period of Interest";
2. All available historical documentation of quantities of waste types generated by each/every Plaintiff and Settled Defendant was reviewed and summarized in tabulated format when actual quantities were provided (otherwise, a description of the wastes is simply noted in this report's text);
3. Total quantities of each waste type generated for each year of the Period of Interest, for each Plaintiff and Settled Defendant, were calculated using the most complete data set available. In every case, there was not a complete database for the relevant time period. Therefore, to the extent possible, an average yearly quantity generated for each waste stream was estimated using Plaintiff and Settled Defendant's data. Depending on the availability of multiple data entries for specific months or years, monthly (averaged and multiplied by a factor of 12 months/year) or annual data (multiple years were averaged) were used to compute an annual average for each waste type.
4. Annual average quantities were multiplied by a factor of 8 to calculate the extrapolated estimated total waste volumes generated for each waste type by a specific Plaintiff and Settled Defendant during the 8-year Period of Interest. If multiple monthly or yearly data were not available, or if there was reason to believe that the operation(s) that generated the waste might have changed substantively (i.e. ceased entirely, or increased by more than a factor of 2) for any Plaintiff and Settled Defendant, extrapolation for 8 years was not performed. Available actual data (based on available documentation) were summed to obtain a total minimum waste volume generated.
5. In cases where no actual historical documents quantifying waste volumes generated were available, secondary information sources such as deposition testimony or interview summaries (USEPA) were reviewed to determine whether any information could be extracted and used to estimate waste volumes generated.
6. All quantities referenced in any document, along with the descriptions of wastes, are taken at "face value".

SEC has not been asked to make findings or form opinions as to whether wastes generated by any Plaintiff or Settled Defendants were disposed at Boarhead Farms. The objective here is to identify, to the extent the available records will permit, the nature and quantity of wastes that were generated by each Plaintiff and Settled Defendant during the period of time that Boarhead Farms operated.

A summary table, listing the types of wastes generated and the known or estimated/extrapolated quantities generated during the Period of Interest, is provided for each Plaintiff/Settled Defendant for whom data was available. Those tables consist of Table I through Table IX. Appendix B contains the detailed tabulated data, as available, for each Plaintiff/Settled Defendant, in the form of Tables 1a through 9.

3. Plaintiff Companies

3.1 American Cyanamid Company (Cytec Industries, Inc.)

The former American Cyanamid Company Bound Brook New Jersey site is approximately 575 acres in size, and is the subject of ongoing remediation activities to address 27 areas of concern which, over the decades of active manufacturing history at the site, were used for disposal of various chemical sludges and other wastes. The site was added to the NPL in 1983 (USEPA, 2006). American Cyanamid Company's global chemical business was spun-off as a separate public company, Cytec Industries, Inc. (Cytec) in late 1994 (Cytec, 1994).

3.1.1 Summary of Historical Operations

3.1.1.1 Manufacturing

During the Period of Interest to this report, from 1969 to 1977, American Cyanamid's Bound Brook NJ facility manufactured dyes, pigments, rubber chemicals, elastomers, organic intermediates and bulk pharmaceuticals (American Cyanamid, 1993). During the late 1970s and early 1980 the Bound Brook plant went through extensive downsizing and many product lines were discontinued (Ibid).

Operations conducted during the Period of Interest were listed by American Cyanamid (1994) as follows:

- Research;
- Administrative;
- Analytical labs;
- Warehouse and dyes blending;
- Research pilot plant;
- Dyes manufacturing;
- Quality control laboratory;
- Pharmaceutical manufacturing;
- Elastomers and Pre-polymer manufacturing;
- Pigments manufacturing;
- Rubber Chemicals manufacturing

3.1.1.2 Waste Generation/Handling

American Cyanamid, in a 1993 response to USEPA, reported that the majority of the waste streams generated on site were managed in on-site disposal and treatment facilities. Those wastes which could not be treated in the onsite wastewater treatment system were shipped offsite for treatment and/or disposal (American Cyanamid, 1993). American Cyanamid (1993, 1994) provided the following general description of the site's waste streams during 1969-1977:

Intermediates Department – (which included the 4NOX and Diphenylamine (DPA) processes [Jerome, 2005]):

- 3NOX, which was disposed of if it had a high BTU value, some sold as a fuel additive (a 4NOX process waste);
- Spent waste acid consisting of mostly sulfuric acid with a small amount of nitric acid (a 4NOX process waste); and
- Waste ammonia (a DPA process waste).

Rubber Chemicals Department wastes:

- List 1
- Mercapto Benzo Thiazole (MBT) tar;
 - Sulfur Mercaptan; and
 - Alkaline ammonia.

Pharmaceutical Department wastes:

- Isopropanol.

The list of waste streams generated at the Bound Brook facility during 1969-1977 provided by American Cyanamid (1993, 1994) is as follows:

- List 2
- Sodium dichromate (by-product of pigments process) sludge;
 - Waste still bottoms;
 - Distillation still pots;
 - Waste solvents;
 - Methotrexate (a bulk pharmaceutical product) acetone;
 - Methotrexate crude carbon;
 - Methotrexate semihyflo HCC cake;
 - BAA (butylacetanilide, a manufactured material) sludge;
 - MNB recovery sludge;
 - Non-regulated solids and sludges;
 - Type "A" organic pigments;
 - Waste "jade green" sludge;
 - Methyl PNA sludge;
 - Aromatic polyurea sludge
 - Dibrom waste sludge;
 - Dibrom ADQSP (intermediate);
 - Cyanaprene (a manufactured product) waste;
 - Cyanacryl waste;
 - DIAC (diacetone acrylamide, a pharmaceutical product) press cake wet with isopropanol;
 - DIAC press cake wet with toluene;
 - Amoxapine (a bulk pharmaceutical) press cake wet with IPA;
 - Hetraza (a bulk pharmaceutical product) press cake wet with acetone;
 - Scrap dyes;
 - Loxapine (a bulk pharmaceutical product) magnesol carbon;
 - Scrap paint chemical.

A December 15, 1977 Cyanamid Memorandum authored by S.A. Frankel provides an extensive list of the types of chemical wastes generated at the Bound Brook Plant, and includes detailed information regarding waste composition (but does not address quantities generated at any point). Included in that list are the following wastes classified by American Cyanamid as hazardous (listed with hazardous substance composition information in [brackets]):

Dyes Department (Bldgs 16, 42, 62, 83, 103, 19):

- 3-NOX (waste from the 4-NOX process) [3-nitro-o-, 4-nitro-o-, and dinitro-o- xylene], a nitroxylol poison B;
- Red 4GB organic liquid [sulfuric acid, isopropanol], a flammable liquid;
- OTN organic liquids [sulfur monochloride, chlorobenzene, acetone], flammable liquids;
- Red ECBS organic liquids [methanol, ethylene dichloride, or methyl alcohol, dimethyl formamide], flammable liquids;
- OTN (nitrite purification) sludge [copper cyanide], a poisonous liquid;
- Vat Brown RR sludge [organic tars, monochlorobenzene], a flammable solid;
- Medola blue sludge [zinc salts, organic tars, methanol], a flammable solid;
- BAA sludge [nitrobenzene], a poisonous solid;
- MNB recovery sludge [nitrobenzene, organic tars] a poisonous solid;
- DCIN sludge [dichlorobenzene, organic tars], a combustible liquid;
- Orange JR organic liquid [sodium methyl sulfate, ethanol] a flammable liquid;
- Acrylic Red B organic liquid [chlorobenzene, methanol], a flammable liquid;

Pharmaceuticals Department (Bldg. 61, 81):

- GYDP Chloroform-dibutyl ether [chloroform-dibutyl ether], a flammable liquid solvent;
- DIAC Rx magnesium sulfate Hyflo-carbon [hexane], a flammable solid;
- Hetrazan [acetone], a flammable solid;
- Loxapine magnesol-carbon [acetone], a flammable solid;
- Pathilon Hyflo-carbon [acetone], a flammable solid;
- PBI Hyflo-carbon [methanol] a flammable solid;
- Spectra-Sorb2B4 Hyflo-Carbon [monochlorobenzene], a flammable solid;
- Tripropoxybenzaldehyde Hyflo-carbon [heptane], a flammable solid;
- PEPB Crude chloroform wastes [chloroform];
- Waste solvents, non-chlorinated waste organic, flammable liquids;
- CEDQ Hyflo [toluene], a flammable solid;
- Amoxapine crude chloroform [chloroform];
- CAA carbon [toluene, copper and copper salts], a flammable solid;
- Caricide Still Heel, a flammable solid;
- CEDQ Hyflo [toluene], a flammable solid;
- Methotrexate Crude carbon/semi zinc-Hyflo-carbon/semi Hyflo-HCl cake/acetone/filter cloths, poisonous and flammable (when acetone included) solids;
- Nonchlorinated waste solvents, waste organic solvents (non-specific), flammable liquids;
- DIAC Crd. Hyflo-carbon [dibutyl ether], a flammable solid;
- DIAC Rx magnesium sulfate Hyflo-alumina [magnesium sulfate, hexane], a flammable solid;
- CS2 water, a flammable liquid;
- Waste solvents, monochlorinated waste organics, flammable;

Wastes listed for the Rubber Chemicals Department include still pot organic residues, Thiazole production wastes, off-grade or cleanings of polyacrylate polymers and polyurethane polymers.

Wastes listed for the Pigments Department included pigments and phthalocyanine blue.

Additionally, a number of Pharmaceutical Department-derived solid wastes containing various alcohols were also classified as flammable solids.

A copy of American Cyanamid's 1978 Eckhart Survey was provided as an attachment to the 1994 response to USEPA (American Cyanamid, 1994). The survey indicates the following for the Bound Brook facility during the year 1978:

- 16,200 tons [therefore, 32,400,000 lbs] of process waste were generated;
- 74 percent of those wastes were disposed of in a landfill, 18 percent in a pit/pond/lagoon, 8 percent incinerated;
- A total of 27 different known disposal sites (including the Bound Brook facility itself) had been used by American Cyanamid for disposal of process wastes since 1950;
- Pits/ponds/lagoons (and not landfills) were used for on-site waste disposal; and
- Process waste components included acid solutions (pH <3), heavy metals and trace metals (specifics unknown), oils and oil sludges, salts and miscellaneous.

Jerome (2005, p. 46) indicates that an incinerator was present on site during the Period of Interest, and was a part of the onsite treatment plant, and that liquid wastes that could not be treated onsite were shipped away for off-site disposal (Ibid, p. 68). Such wastes included alcohols, flammable solvents and ammonia (Ibid, pp 67, 81).

3.1.2 American Cyanamid Wastes Generated 1969-1977

Table I of this report provides a summary of documented waste volumes generated by American Cyanamid Bound Brook during the Period of Interest. A detailed summary of the available data and calculations of actual reported/extrapolated total waste volumes generated are provided in Appendix B, Tables 1a and 1b, respectively. American Cyanamid Bound Brook reported having utilized the services of waste haulers Jonas Inc. of Sewell NJ (Jonas) and Advanced Environmental Technology Corporation (AETC) of Morris Plains NJ during the 1970s (American Cyanamid, 1993).

In its 1993 response to USEPA's request for information, American Cyanamid provided a handwritten summary of "Waste Shipments Made by Bound Brook Plant via Jonas 1976 – 1978". A summary page for each waste type is followed by detail pages listing shipping dates and quantities. The majority of the shipping dates listed are in the year 1977. The date range represented is 8/31/1976 through 12/31/1978, a total of 28 months or 2.33 years. The information contained in the American Cyanamid summary is reproduced on the first page of Table 1a.

A series of American Cyanamid shipping documents from the Bound Brook NJ facility (BQ0104-150), dating (where legible) from 1976, indicating Jonas Waste Removal of Sewell NJ as hauler for loads of "1 T/W" (tank wagon, of unspecified volume) of each of the following materials:

- 11 Loads of Waste flammable solvent from Building 81;
- 3 Loads of waste still bottoms from the 872 building;
- 26 Loads of waste ammonia water aqueous solution "from 688 building";
- 1 Load of isopropyl alcohol waste flammable liquid;
- 6 Loads of waste tar organic liquid from Building 114; and
- One illegible document, for a single load of waste water (dated 1/176).

However, based on the vague volumes represented (the tank wagon volumes are not specified), and because the data are considered redundant (1976 data are already available both from American Cyanamid's 1993 response attachment, and from the Jonas ledger for 1976 [see below]), the above shipping document information was not entered into Table 1a.

A variety of documents produced by Jonas were available for SEC's review which contain some information regarding quantities and types of American Cyanamid Bound Brook wastes hauled by Jonas during the 1970s:

1. A 1972 application by Jonas for Certification to Collect or Haul Solid Waste (Exhibit 20, Jonas 1995), indicating estimated weekly volumes of 30 cubic yards (cyds) of waste code 10 and 2,000 gallons of waste code 09, both to be hauled from Bound Brook NJ. A February 18, 1975 correspondence to NJDEP from Jonas, Inc., indicates that Jonas' waste codes 09 and 10 respectively signify "still bottoms" and "wash solvents".
2. A Jonas Operational Statement covering activities during the year 1974. The statement indicates:
 - 89,682 gallons of bulk liquids/semi-liquids hauled from Bound Brook NJ; and
 - 1,004,000 gallons of hazardous waste liquids hauled from Bound Brook NJ.
3. A Jonas Operational Statement covering activities during the year 1975. The statement indicates:
 - 134,500 gallons of bulk liquids/semi-liquids hauled from Bound Brook NJ;
 - At least 875,793 gallons (one illegible quantity) of hazardous waste liquids hauled from Bound Brook NJ;
 - 265,000 gallons of chemical waste liquids hauled from Bound Brook NJ.
4. A series of handwritten documents (known to be Jonas ledgers) with dated entries and volumes for wastes from American Cyanamid "BB" or "Bound Brook, NJ", totaled at the end of each year's worth of entries, for the years 1976, 1977 and 1979

The waste types/quantities from the above-listed Jonas documents were also entered into Table 1a.

As shown in Table 1a, the American Cyanamid 1993 information for 1976-1978, when summed, results in a total of 49 drums of unknown weight plus 54,780 gallons plus 4,906,040 pounds of waste substances generated for offsite shipment. The total gallons of material shipped in 1977 alone, according to Jonas' ledger, was 4,676,820 gallons, which would certainly represent more than 5.0 million pounds of materials. The difference between the Cyanamid and Jonas information indicates that the American Cyanamid information may be incomplete. It should also be recognized that Jonas was not the only waste disposal contractor whose services were utilized by American Cyanamid during the 1970s. Therefore, the totals showed in Table 1a represent minimum quantities of wastes generated.

Eight-year extrapolations of both data sets are provided in Table 1b (Appendix B). American Cyanamid's documented quantities for the 2.33 year period (8/1976 through 12/1978) were multiplied by a factor of 3.43 (to bring the total timeframe to 8 years), indicating 168 drums of unknown weight plus 187,895 gallons plus 16,827,717 pounds of generated wastes. Using the Jonas data from 1974 through 1977 (with the assumption that 1970, 1971, 1972 and 1973 were equivalent to 1974 in waste generated), produced an extrapolated 8-year total of 14,921,473 gallons of wastes generated. Table I of this report summarizes calculated totals and extrapolations for American Cyanamid's waste streams.

3.2 National Rolling Mills (TI Group Automotive Systems, LLC)

The National Rolling Mills facility was located on Morehall Road, Malvern, Pennsylvania. During 1970 through April 1974, the facility in Malvern PA was known as the NRM Division of Bundy Corporation (later known as TI Automotive Systems), and thereafter as National Rolling Mills. The period of interest specific to the plaintiff party TI Automotive, as successor to Bundy Corporation, for the purposes of waste volume estimation, is therefore defined as 1970 through April 1974 (inclusive).

3.2.1.1 Manufacturing

During the 1969-1977 timeframe, two different divisions were in operation at the Malvern facility: the Steel Division (beginning in the early 1960s); and the Acoustical Division (beginning in the 1970s) (Winters, 2004).

The Steel Division produced steel products to customer specifications, utilizing the following processes (Freda, 2004, Civitello, 2004, Winters, 2004, Chesky, 1994, 2004):

1. "Pickling" – where relatively thick coils of "hot" steel came into the plant and were uncoiled, welded end-to-end using a "butt welder" to create a continuous line of steel, and then pulled through a tower-like structure and sprayed on both sides with a hydrochloric acid solution ("pickle liquor") to remove scale and rust.
2. Cleaning Line: Pickling was followed with a caustic rinse (a 13% sodium hydroxide solution, per Chesky, 1994, 2004), followed by fresh water rinses;
3. "Cold Rolling"- coating the steel with oil (a lubricant/coolant called "Ricosol 19, according to Chesky, 1994) and running it through a series of rollers in the roller mill equipment (referred to as "Z mills"), using pressure to reduce the steel to the desire gauge thickness. Following the completion of the rolling process, a caustic rinse was performed in the Cleaning Line, to clean off residual oil, followed by additional water rinses;
4. Annealing, or heat treatment, where the steel was heated in a furnace;
5. Re-rolling, or temper rolling, in the temper mill, was performed as necessary, to set the final gauge (thickness) and hardness, respectively, according to customer specifications. Light oils and water were used as lubricants, and a light coating of oil was applied at the end of the tempering process, as a rust preventative (Civitello, 1993);
6. Slitting – where the steel was cut to desired lengths/widths;
7. Plating – a continuous process, following a alkaline cleaning with a sodium hydroxide solution (Civitello, 1993), involving the addition of a zinc coating on to the surface of the steel via bathing the steel in an electrolytic plating solution (which also contained sodium cyanide) in a series of ten open tanks, followed by water rinses via tanks and a final spray rinse. If customer specifications called for it, phosphate was applied to the steel to allow the application of paint (Capone, 1993); and lastly,
8. Painting – The paint line was reportedly installed in 1974 (Civitello, 1993). Water soluble, high-quality latex paint was applied to steel products after a final rinse (Civitello, 1993). Methyl ethyl ketone (MEK) was used to test the painting process by rubbing it on the paint finish (Freda, 1993).

Starting in the late 1960s (approximately), the plant began pickling steel for other steel companies (Piotti, F., 2005).

The Acoustical Division, active during the 1970s, made acoustic suspension systems, using "coil stock" (slit steel material). The steel was sent through forming machines to bend it into the desired configurations (Winters, 2004).

3.2.1.2 Waste Generation/Handling

A number of the manufacturing operations generated waste materials, as follows:

Pickling Line Wastes:

The National Rolling Mills pickling line was positioned over a holding tank that received the spent hydrochloric acid solution. When the solution became too low in acid content (typically, 4 to 6% acid was the lowest usable acid content, per Piotti, 2005), and the iron oxide content became too high, the spent pickle liquor was removed from the tank, pumped into a rubber-lined tank (one of four available, 10,000 gallon capacity each), and later hauled away by outside vendors (Civitello, 1993, Winters, 1993, Piotti, 2005). During the late 1960s to mid-1970s the company installed a reclamation plant to reclaim hydrochloric acid from spent pickle liquor via a distillation process (Winters, 1993, Chesky, 2004). Piotti (2005, p. 85) recalled that the reclamation plant installation occurred by 1970, with the plant running successfully by 1972. The liquid residue from that reclamation plant was called ferric/ferrous chloride and was hauled away by a contractor's tankers (Winters, 1993, Piotti, 2005).

During 1969 -1977, it has been estimated that three to five tanker loads of pickle liquor were hauled out each week in 4,000 to 5,000-gallon tankers (Quici, 1993). Chesky (2004) stated that when the reclamation plant was running, only 4,000 to 6,000 gallons per week of waste (spent acid from the pickle line) would be hauled away. Piotti (2005) recalled that 1800 to 2100 gallons per shift of spent pickle liquor were typically generated, and there were, on the average, 8 shifts per week (with a maximum of 12 to 14 shifts/week).

Cleaning Line Wastes:

Caustic rinses, consisting of water containing sodium hydroxide, were discharged into a large holding tank and hauled out daily by a contractor (Winters, 1993, Chesky, 1994). Chemicals were added to the waste water to make the oil separate out, and the oil was skimmed off into a separate tank, and later hauled offsite to be recycled by a contractor (Chesky, 2004). During some periods, six to ten 2,000 to 3,000-gallon tankers per day were needed to remove the water-based waste (Winters, 1993).

Cold Rolling Process (Z Mills) Wastes:

Waste emulsified oils from the Z Mills (cold rolling process) were generated at a rate of several hundred gallons per day, and hauled away by contractors (Winters, 1993). The wastes consisted of liquid "iron soaps" from the animal fats in the coolant, and sludge, and were stored in a 12,000 gallon tank (later a 24,000 gallon tank) and cleaned out approximately every three months (Chesky, 1994). During overhaul/cleanup operations, which occurred several times per year, as much as 15,000 gallons of the oil waste might be collected at one time for disposal (Winters, 1993). The sludge was shoveled into 55-gallon drums and hauled away by a contractor (Chesky, 1994). The waste storage tank(s) were periodically flushed out with a solution of 2% "Quaker 77XX" in water to break down the iron soaps (Chesky, 1994), and the resulting waste was hauled away.

Heavy oil sludges formed by soluble oils mixed with iron filings from the cold rolling mill operation were also generated, and were hauled out using tank trucks. However, the volumes generated are not known (Freda, 1993).

Temper Mill Wastes:

Temper mill rolling oil waste was hauled out by vendors during the 1969 -1977 period (Civitello, 1993), but the volumes generated are not known based on currently available information.

Plating Line Wastes:

Plating operation produced a water/sodium cyanide mixture (Winters, 2004), as well as filtrates and crystalline sodium carbonate waste products (Capone, 1993, Freda, 1993, Freda, 2004). Those plating wastes were either placed in 55-gallon drums and hauled out by a contractor (Freda, 1993) or liquefied and pumped into a holding tank for future transferal to a waste hauler (Freda, 2004). No information is available regarding the volumes of such wastes generated. Reportedly, a cyanide-containing liquid containing "floc" from the filtering units on the electroplating line, and a slurry of grease and oil contaminated with cyanide, were produced by the plating operation at an estimated rate of 500 gallons per day during the 1970s, and were hauled away by a contractor once or twice a week (Winters, 1993).

Annealing Process Wastes:

The annealing process produced no waste products (Civitello, 1993)

On-Site Wastewater Treatment:

An on-site wastewater treatment plant was installed in 1974 (Freda, 1993) and operated beyond 1977 (Winters, 1993). Prior to treatment plant operation, wastewaters were collected in holding tanks and subsequently pumped out to waste hauling contractors' trucks for offsite disposal (Winters, 2004). The treatment plant removed oils, greases and sludges from various liquids generated by the manufacturing processes, including rinse waters from the pickling operation, alkaline cleaning waters from the plating line, and cleaning waters from the cleaning line in the mill (Winters, 1993). The liquid effluent from the treatment plant was discharged to the public sewer authority, and the remaining sludge was hauled away for offsite disposal by a contractor (Winters, 1993). Rinse waters from the paint line, which started operation in 1974, were always treated on site (Civitello, 1993).

3.2.2 National Rolling Mills Wastes Generated 1969-1977

Table II of this report provides a summary of waste volumes generated by National Rolling Mills during the period from 1970 through April 1974. A detailed summary of the available data and calculations of actual reported/extrapolated total waste volumes generated are provided in Appendix B, Tables 2a and 2b, respectively.

The estimated rates of the various waste quantities generated over time at the National Rolling Mills facility summarized above are based completely on former employee's recollections. It is also apparent from the employee interviews/deposition testimonies that Jonas and DeRewal were not the only waste hauling contractors utilized by National Rolling Mills during the 1969-1977 period. Further, after 1972, the acid reclamation plant was in operation, and, when it was operating effectively, its usage (reportedly) significantly reduced the generated volume of spent acid/ferric chloride sent off-site for disposal (Chesky, 2004). Therefore, given so many variables, basing the estimation/extrapolation of spent acid wastes generated each year on employee recollections becomes problematic.

Turning to the actual quantitative information available, an incomplete record exists of waste types/volumes hauled from the National Rolling Mills facility during the 1969-1977 timeframe. Available documentation of actual numerical volumes and types of wastes is limited to Jonas ledger entries for 1976 (dating from January to October) and a series of National Rolling Mills bills of lading and Jonas invoices dating from May, July and August 1975, all of which only involve spent pickle liquor-derived liquid wastes. A series of "Accounts

Receivable" ledger pages for a portion of 1973, 1974 (entire year), 1975 (entire year), and a portion of 1976, labeled "Nat. Rolling Mills" are also available, and indicate dates and debit/credit amounts, but do not list waste types or volumes shipped and, in the absence of any supplemental information on shipment volumes and waste types, therefore could not be utilized at this time. The available actual wastes generated data are summarized in Table 2a of Appendix B.

It is possible, however, based on available documentation of actual amounts hauled during 1975 and 1976, to calculate a minimum extrapolated annual volume of waste acid (ferric chloride/spent pickle liquor) generated by National Rolling Mills. As summarized in Table II, an average result of 452,200 gallons of spent acid waste estimated to have been generated per year (Table 2b [Appendix B] provides additional detail regarding those calculations). Again, that figure is believed to represent a minimum amount for the time period, as it does not include haulers other than Jonas in its basis, and it is likely that the available documentation is incomplete for the years 1975-1976 (for example, the accounts receivable ledger for 1975 indicates additional shipping/billing dates beyond those listed in the available shipping documents).

Utilizing the available data set and the same extrapolation assumptions (see Table II), the Bundy Corporation ownership period, from 1970 through April 1974, would therefore represent a minimum of 1,959,533 gallons of waste acid generated and shipped offsite.

3.3 Philco Ford (Ford Motor Company)

The Philco Corporation changed its name to Philco Ford in the mid-1960s (BSAI005378). Philco Ford apparently operated in at least two Philadelphia area locations during the relevant period: located at 601 Liberty Street, Watson town Pennsylvania, and at 4700 Wissahickon Avenue, Philadelphia, Pennsylvania. A third location, at C and Tioga in Philadelphia has also been mentioned, and was reportedly the location of the Philco Ford Headquarters building (Plant 2), and another building known as "Plant 10", which was the manufacturing/assembly facility (FORD000140).

3.3.1 Summary of Historical Operations

3.3.1.1 Manufacturing

The Watson town facility manufactured wood cabinets for televisions, stereos, and radios, and was sold by Philco Ford in the early 1970s (BASI006039). Ford, in its 1993 response to USEPA's inquiries, indicated that it is possible, based upon the nature of those processes, that lacquer finishes, shellacs, wood glues, and hide glues were used in the manufacturing processes. Ford also reported that, in the mid-1960s, the plant did certain development work in high density foam, possibly urethane manufactured by PPG Industries (BSAI006040). "Plant 10" manufactured or assembled television sets, and closed in late 1972 or 1973 (FORD000141).

The Philadelphia facility manufactured weaponry, such as sidewinder missiles, for the United States government, and reportedly ceased operations in approximately 1972 (BSAI006040).

3.3.1.2 Waste Generation/Handling

Ford's counsel advised USEPA that they did not have any information or documents regarding the nature or quantity of by-products and wastes produced, or the processes which generated each by-product or waste (BSAI006040) for Philco Ford. As a result, the only documents currently available regarding the types and quantities of wastes generated by Philco Ford during the Period of Interest are DeRewal documents provided by USEPA (1992, 1994).

3.3.2 Philco Ford Wastes Generated 1969-1977

Table III of this report provides a summary of known waste volumes generated by Philco Ford during the Period of Interest. A detailed summary of the available data is provided in Appendix B, Table 3.

The waste types/volumes indicated in Table III should be considered a minimum total amount potentially generated by the Watson town facility. No other information is currently available. The existing information regarding the Watson town facility's wastes is, in my opinion, insufficient, both qualitatively and quantitatively, to permit extrapolative estimates of total wastes potentially generated at the Watson town plant during the relevant timeframe.

3.4 Standard Pressed Steel (SPS Technologies, LLC)

The Standard Pressed Steel Company, known as SPS Technologies, LLC (SPS) since 1978, began operations at its Highland Avenue, Jenkintown, Pennsylvania location in 1920, and operated there continuously during the Period of Interest (1969-1977) (SPST00278).

3.4.1 Summary of Historical Operations

3.4.1.1 Manufacturing

The nature of Standard Pressed Steel's business at the Jenkintown facility during 1969-1977 was the manufacture of precision fasteners and precision metal products. Manufacturing processes included forging, machining, grinding, rolling, heat treating and plating of metal parts (SPST00278).

Several manufacturing divisions of Standard Pressed Steel were reportedly in operation at the Jenkintown plant facility during the Period of Interest (D. Stewart, 2005 deposition, D. Shea, 2005 deposition):

- Aerospace – manufactured precision fasteners; and
- Unbrako – made industrial fasteners, nuts/bolts; and
- Hallowell – during 1970, manufactured metal furniture.

A 1969 brochure (BSAI071053-56) depicts the plant layout and lists the various manufacturing processes, including:

- Manufacture of carbide dies, punches and tools;
- Manufacture of screws, bolts, wrenches, tie-rods, involving forging, rolling, pointing, stamping, grinding, pressing and induction heating;
- Heat treating operations, including annealing, normalizing, hardening, quenching, tempering, solution treating, age hardening, stress relieving, carburizing, bright hardening, sub-zero transformation, sand blasting, stabilizing, pickling, wheelabrating, quenching in a salt or oil bath, tempering, cleaning and oiling;
- Mechanical, chemical and metallurgical testing;
- Precision plating, including 15 electroplating lines, 2 vacuum plating lines, 3 preclean lines, 4 Vacu-Blasters and 2 miscellaneous lines;
- Precision thread-rolling;
- Manufacture of commercial and aerospace fasteners;
- Plant machine re-building, tools/parts fabrication;
- Manufacture of rocket motor cases, nuts, collars, and "specials";
- Manufacture of nuts, special products, pipe plugs, socket head cap screws, special locknuts and other special parts.

Raw materials purchased for plant operations included the following (based on former Standard Pressed Steel buyer David Stewart depositions, 2000, 2005, and Standard Pressed Steel representative Dennis Shea deposition, 2005):

- Cutting oils (e.g. Atlantic 30, Transkut 70);
- Cyanide;
- TCE (purchased 10 to 20 drums/month);
- Chromic acid;

- Acetone;
- Cetyl alcohol;
- Lubricating oil (stored in a 4500 gallon tank);
- Cutting oil;
- Kerosene (delivered in bulk);
- Quenching oils;
- Industrial cleaners (soaps);
- Honing oil;
- "Immunol" degreaser/cleaner;
- Fuel oil (No. 6 bunker) for heating;
- Rust preventatives;
- Ferric and non-ferric alloys.

3.4.1.2 Waste Generation/Handling

As reported by SPS (1992) to USEPA, the basic types of waste generated at the Jenkintown facility consisted of the following:

1. Scrap metal – metal chips and pieces, produced during fastener manufacturing processes such as grinding and thread roll (SPST00179), essentially all of which was placed in roll-off containers and sold to scrap dealers for recycling (SPST00278, -00179);
2. Empty steel drums – from raw materials (oils and chemicals) purchased by the plant. If returnable, the drums were sent back to suppliers for reuse. If non-returnable, the drums were either sold to used drum recyclers or filled with waste chemicals for offsite disposal (SPST00279);
3. Waste oils – oils which had become contaminated with dirt, water, or fine metal particles during metal cutting and grinding operations (SPST00279, -00180). Collected in storage tanks and sold in bulk to recyclers (SPST00279);
4. Grinding sludge – an oily mixture of metal and abrasive particles generated during the grinding of metal parts, and stored in roll-off containers or drums prior to disposal. SPS reports sending this sludge waste to sanitary landfills during the period in question (SPST00279);
5. General plant trash – paper, cardboard, wood scraps, etc. collected in dumpsters or roll-off containers and removed on a regular basis by a trash hauler for landfill disposal (SPST00279, -00181);
6. Plating waste water from the plating process – including rinse waters and spent plating baths/solutions from the plating process. These liquids were normally drained to the plating waste treatment plant on site (in operation since 1951). Treated wastewater was discharged to a local stream and the sludge generated by the treatment process was collected in dumpsters and periodically removed by waste haulers in tankers or drums for landfill disposal (SPST00279, -00182). SPS provided the results of chemical analyses and an EP toxicity test performed on a 1991 sample of the sludge, which demonstrated the presence of oil/grease, barium, cyanide, cadmium, chromium, nickel, copper, and zinc, among other constituents (SPST00385);
7. Waste degreaser fluid – consisted of "still bottoms", a mixture of trichloroethylene (TCE) and oil, resulting from the distillation of used TCE degreaser fluid, removed from site by waste disposal contractors (SPST00279). SPS indicated that this waste contained approximately 50 percent TCE and the remainder oil and grease (SPST00182).

8. Waste cetyl alcohol - a solution of 12 ounces per gallon cetyl alcohol dissolved in VM&P naphtha (approximately 10 percent cetyl alcohol, SPST00182). This solution became waste material when too much of the naphtha boiled off during the process (SPST00183). Drummed chemical waste identified as "alcohol" is probably a reference to this mixture. This waste was pumped into 55-gallon drums and removed by waste disposal contractors;
9. Plating Waste - a term referring to a variety of spent solutions used in Standard Pressed Steel's plating process, including plating sludge from depleted plating baths, chromic acid, cyanide solutions, used acetone, and "bright dips". SPS (SPST00280) indicates that all of these wastes would currently be classified as Hazardous Waste. "Chromic acid" was a solution normally comprised of 6 ounces of chromic acid per gallon of water. The terms "acid" or "bright dip" in Standard Pressed Steel waste-related documents may refer to spent chromic acid (SPST00280). All of these wastes were normally pumped into 55-gallon drums for removal by waste disposal contractors (SPST00183).

In its 104(e) responses to USEPA, SPS indicated that Standard Pressed Steel had disposed of wastes with Marvin Jonas/Jonas Removal and DeRewal Chemical Company/Manfred DeRewal, and provided available historical documentation of disposal events. SPS indicated in its 1988 and 1992 104(e) responses that during 1969 and 1977, waste degreaser fluid, waste cetyl alcohol, and plating waste were removed from the Jenkintown facility for disposal by Jonas Waste Removal (SPST00280-281), and that from March 1973 to February 24, 1977, hazardous wastes were removed by DeRewal Chemical Company (SPST00189).

No information was provided by SPS regarding total amounts of wastes generated at the facility during the 1969-1977 timeframe. For each waste stream, SPS indicated that it was not possible to accurately identify the annual volume of material generated during the relevant time period (SPST00178 -183).

Waste pickups by disposal contractors during the relevant time period were reportedly arranged by personnel at the maintenance department, who would request a pickup via a requisition form sent to the purchasing department (D. Shea, 2005).

3.4.2 Standard Pressed Steel Wastes Generated 1969-1977

Table IV of this report provides a summary of documented waste volumes generated by Standard Pressed Steel during the Period of Interest. A detailed summary of the available data, and calculations of actual reported/extrapolated total waste volumes generated, are provided in Appendix B, Tables 4a and 4b, respectively.

In its responses to USEPA 104(e) requests, SPS provided copies of documents related to waste disposal with waste hauling contractors Marvin Jonas/Jonas Removal and DeRewal Chemical Company (SPS, 1988, 1992, and 1996). The documents generally consist of SPS requisitions (internal requests for waste removal), Standard Pressed Steel purchase orders (issued to the waste haulers), receipts from Jonas, and invoices from DeRewal to Standard Pressed Steel. Waste types and quantities (generally, in terms of the number of 55-gallon drums) are frequently indicated on those documents.

In order to derive estimates of wastes generated by Standard Pressed Steel during the relevant timeframe, SEC has prepared a tabulated summary of waste types and quantities indicated on each document, presented as Table 4a. The information provided on each waste disposal document was tabulated, with the exception of requisitions/Purchase Orders (POs) and receipts/invoices that clearly were related to the same shipment (i.e.,

same date, volume & type of materials noted). In order to avoid duplication, related documents were therefore grouped rather than tabulated separately.

While it is recognized that not every Standard Pressed Steel requisition necessarily resulted in a waste pick-up, there is no information provided in the documents to suggest otherwise. It also should be recognized that the available set of documents has not been certified by SPS to be complete for all Jonas/DeRewal waste removal events. Further, the available waste disposal documentation is limited only to Jonas/DeRewal, and does not provide any information on the types/volumes of waste disposed of with other contractors. Therefore, it is appropriate to consider the totals calculated in Table 4a for each waste stream as minimum volumes/quantities of Standard Pressed Steel -generated wastes.

Table 4a indicates total documented quantities of waste acetone, chromic acid, cyanide, degreaser, nickel mixed chromic/cyanide wastes and other wastes. The "other" category encompasses non-specific wastes and unique wastes (only one disposal event existed in the documents).

Recognizing that Table 4a's information only represents minimum waste quantities generated/disposed, Table 4b utilizes the quantities summarized in Table 4a to extrapolate the potential amount generated during the approximate 8-year period (based on late 1969 to 1977, rounded to 8 year duration). Table 4b calculates monthly averages for each waste type, based on monthly waste disposal during each year for which data are available. An average yearly quantity is generated for each waste type by multiplying the calculated overall monthly average by a factor of 12. Multiplication by a factor of 8 results in the total extrapolated waste quantity potentially generated by Standard Pressed Steel during the relevant time period.

Table IV summarizes the information provided in Tables 4a and 4b, indicating the following ranges of total volumes of each waste stream generated by Standard Pressed Steel and disposed of with Jonas/DeRewal, over the 8-year Period of Interest (the low end of each range represents the actual documented total, and the high end of the range represents the 8 year extrapolated total):

- Acetone waste: from approximately 200 to over 20,000 gallons;
- Chromic acid waste: from 30,000+ to more than 240,000 gallons;
- Cyanide acid waste: over 20,000 to nearly 175,000 gallons;
- Degreaser waste: nearly 9,000 gallons to over 135,000 gallons;
- Mixed chromic/cyanide wastes: 35,000+ to over 290,000 gallons;
- Nickel waste: from approximately 200 to more than 20,000 gallons;
- Other wastes: over 36,000 to 349,000 gallons.

3.5 Western Electric (Agere Systems, Inc.)

3.5.1 Summary of Historical Operations 1969-1977

As stated in Agere Systems, Inc.'s (Agere's) Initial Disclosures Statement (2003), the current plaintiff, Agere Systems, Inc. (Agere) is the former Microelectronics Group of Lucent Technologies Inc. ("Lucent"), which separated from Lucent in June 2002. Lucent was a spin-off of AT&T Corporation, which was the successor in interest to Western Electric Company Inc. (Western), making Agere the successor in interest to any potential liability associated with wastes disposed at the Boarhead Farms site.

Available documentation indicates that the company known as Western Electric Company, Inc. operated three facilities of interest during the subject timeframe (1969-1977): the North Carolina Works, the Allentown Works, and the Reading Works. A fourth facility, known as "Montgomery" is mentioned in the available file materials, but no details as to location or operations are known at this time.

3.5.1.1 The North Carolina Works

The former North Carolina Works reportedly consisted of a main factory at Lexington Road, a nearby satellite operation called the Vargrave Shops, and two Greensboro satellite operations called the Greensboro Shops and Burlington Shops (AGER000011). Between 1969 and 1976 (the date of facility closure), the Greensboro Shops manufactured products that included rigid and flexible printed wiring boards, precision machined parts, crystal filters, electronic switching system card writers and cables, military equipment, and printed waveguide devices (AGER000011).

The former Western Electric facility (now closed, AGER000011) located on Lexington Road, Winston-Salem North Carolina, was where products such as rigid and flexible printed wiring boards, precision machined parts, crystal filters, electronic switching system card writers and cables, military equipment (unspecified) and printed waveguide devices were manufactured (Agere, Initial Disclosure, 2003). Operations at the Lexington Road facility reportedly primarily involved soldering of printed circuit boards, component insertion into circuit boards, manufacture of thin film resistors and capacitors, assembly of wave guide devices, and cable forming (Santarelli, p. 107-108).

A more detailed description of some manufacturing processes at the Lexington Road facility is available:

- The soldering of circuit boards utilized preprinted circuit boards (manufactured elsewhere) and was an automated process using flux (pine resin dissolved in alcohol) and molten solder, followed by removal of extra solder and cleaning with solvents (perchloroethylene, ethylene glycol, monoethyl ether, isopropyl alcohol) (Santarelli, p. 109-112).
- The manufacturing process for thin film resistors is believed to be similar to that described for the Allentown facility (see following section) (Santarelli, p. 114).
- Capacitor manufacture involved the metal tantalum in powdered form, dissolved in TCE, heated and pressed in a very high temperature oven, and then "cured" with low concentration acids (Santarelli, p. 115).
- Wave guide devices and cable forming were primarily mechanical manufacturing processes, involving assembly (Santarelli, p. 117).

Waste Generation Practices

Limited information regarding the North Carolina facilities waste generation practices was available to SEC during the preparation of this report. AT&T reported in its 1996 response to the USEPA's 104(e) request that from 1972 to 1976 (when the plant closed) the North Carolina Works Greensboro plant operated a recovery system known as "CAPER" (AGER000007, also Santarelli, p. 126) which generated ammoniated copper salts (a dry salt) from liquid spent ammonium persulfate etchant generated as a waste from the production of printed circuit boards. Prior to that time, from 1969 to 1972, the liquid was reportedly processed by Echo, who then transported and sold the resulting copper sulfate product to Sylvan Chemical (Santarelli, p. 126-127, p. 136). AT&T indicated that those copper salts were sold as a product and were not disposed of as waste at any point during 1972-1976, and that Sylvan Chemical Corporation purchased the copper salts to resell (AGER000008, AGER000011). Information from USEPA (Enclosure D of November 8, 1995 correspondence to AT&T, AGER000026-33) documents shipments of "copper salts (residue)" from Western Electric Company's Winston-Salem NC address to Sylvan Chemical Corporation in Englewood Cliffs NJ during the first quarter of 1972.

Other wastes generated by the North Carolina Works are listed as: flux and flux thinner, waste chlorinated solvents, used oils, "electroless" [sic] copper solution, and cleaners/cleaner conditioners (AGER000011-12), but AT&T did not provide further details. Acid and base liquid wastes were sent to the on-site treatment plant, while waste that contained metals was sent off-site for reclamation and recovery (Santarelli, p. 126).

The waste stream associated with the thin film resistor manufacture at the North Carolina Works was reportedly minimal. A metal plating operation used potassium gold cyanide, but it was used and then recovered (Santarelli, p. 125). "Photoresists" were used in very small quantities and freons were used as degreasers but were mostly spent (used up) in the process. Small quantities of solvents such as xylene or acetone were used for cleaning (Santarelli, p. 125).

Prior to 1973, wastes generated by the North Carolina Works were segregated and stored in 55 -gallon drums. After 1973, some wastes were stored in large storage tanks (AGER000012). Waste transporters would remove the wastes from the drums and tanks and place them in tank trucks for removal. The Greensboro Shops reportedly had two 25,000 (approx.)-gallon holding pits to contain spent ammonium persulfate. The ammonium persulfate waste contained approximately 2.0 to 3.5 ounces of copper per gallon, with approximately 36,000 gallons/month generated during the period from 1971 through 1974 and approximately 20,000 gallons/month generated in 1975 and 1976 (AGER000012). AT&T did not provide specifics regarding the quantities generated of other types of waste (AGER000012).

3.5.1.2 The Allentown and Reading PA Works

Manufacturing Processes and Waste Generation – Allentown Works

The Allentown facility, located at 555 Union Boulevard, Allentown Pennsylvania, was part of Western Electric's Electric Components Division, and originally opened in 1948. Manufacturing or other operations during the time Period of Interest reportedly included manufacture of semi-conductors, thin film circuits, integrated circuits, ferrite devices, electron tubes, sealed contacts, and hybrid integrated circuits (Agere, Initial Disclosure, 2003, AGER000062). A 1976 "Space Report" for the Allentown Works (Santarelli-4 Deposition Exhibit, 2/22/2005, BSAI070641- 61) indicates the locations of plating, thin film pattern generation, diffused silicon transistor, molding, chip processing/diffusion, heat treatment, photo resist, photo lithography, thin film substrate, ferrite sheet, silicon processing, precious metal storage, and gold reclamation manufacturing operations, as well as a chemical diagnostic laboratory.

There were reportedly four manufacturing processes at the Allentown Works during the Period of Interest: miniature tubes, dry reed switches, thin film circuits, and integrated circuits (Santarelli, p. 35):

- Miniature tubes (aka electron tubes) primarily consisted of glass and metal parts put together mechanically. TCE and Freon solvents were used to clean the parts. The manufacture of miniature tubes was phased out in 1970 or 1971 (Santarelli, p. 36);
- Dry reed switch (aka sealed contacts) manufacture involved the mechanical assembly of metal pieces, gold contacts, and glass cases. TCE solvent was used for cleaning (Santarelli, p. 37-38). The dry reed switch manufacturing process was phased out by the mid-1970s (Santarelli, p. 60);
- Thin film circuits were manufactured with a ceramic base upon which three layers of various metals were built up. Gold, silver and palladium metals, plus a copper "sacrificial layer" were used. A photoresist layer was then applied, masked, put through a photolithographic process (exposure to light), cleaned, and etched with a pattern and then cleaned and cut up into the required individual chips and packaged. Mineral acids (including possibly phosphoric acid) and copper sulfate were used in the etching process. Solvents such as xylene, acetone, mineral spirits, Freon, chlorinated solvents, and/or phenol-containing mixes were used in the intermediate cleaning processes. Epoxies, gold and solder were used in the packaging step. After packaging, the product was again cleaned, using detergents, hydrogen peroxides, Freon, and/or chlorinated solvents (Santarelli, p. 39 – 47).
- Integrated circuits (aka manufactured semiconductors or hybrid integrated circuits) were manufactured in a process similar to that described for thin film circuits, except that up to 12 layers of metals like gold and palladium, plus other materials like arsine, phosphine, diborane, and arsenic were built up on a silicon base. Layers were applied using diffusion, ion implantation, electroplating (with precious metals, cyanide, sodium hydroxide, mineral acids, Freon, per Santarelli p.88 - 91) and vapor deposition techniques. The layered intermediate product was then cleaned (using the same techniques and materials as thin film circuits), photolithographed (using photoresist, strippers [hydrogen peroxide and ozone], developers [glycol ethers, not used for thin film circuits] and rinses), etched (using hydrogen fluoride, phosphoric acid, carbon tetrachloride, chloroform, boron trichloride, chlorine and/or bromine) and prepared for packaging (Santarelli, p. 48 – 54).

From 1969 through 1977, the Allentown Plant reportedly generated the following types of waste (AGER00063):

- Copper nitrate;
- Copper sulfate;
- "Mixed chemicals";
- Chlorinated solvents (trichloroethylene);
- Flammable solvent (acetone, alcohol, toluene, methanol);
- Industrial waste treatment plant sludge;
- "J-100" photo-resist stripper (a mixture of phenol-containing materials and chlorinated solvents, [Santarelli, p. 87]) and photoresist;
- Waste acids (nitric acid, hydrofluoric acid); as well as
- General plant trash (wood, paper, glass, cans, food, construction/demolition-type debris).

The deposition testimony of Marianne Santarelli, Global Director EH&S for Agere (February 22, 2005) provided additional details on waste generation:

- The miniature tubes manufacturing process generated spent cleaning solvents, primarily TCE, and bulk metal and glass waste. The spent solvent material was drummed and "sold" (Santarelli, p. 66- 67).

- Dry reed switch manufacture generated waste gold (sent out for reclamation) and spent TCE solvent (stored on site in drums) (Santarelli, p. 74);
- Thin film circuit manufacture generated precious metal (gold, silver, palladium) waste (sent out for reclamation), waste copper and copper compounds (copper sulfate), cleaning solvent waste (TCE, xylenes, acetone, mineral spirits), hydrogen peroxide mixtures, and scraps of lead solder. Copper nitrate and copper sulfates were collected in plastic-lined 30-gallon drums. Spent TCE was drummed and "sold" or "recycled". Other cleaning solvents (xylenes, acetone, etc.) were incinerated off-site (Santarelli, p. 75-76).
- The waste stream generated from the integrated circuits manufacturing process included essentially the same waste streams as thin film circuits. Hydrofluoric acid was also used, and the waste was handled separately from other types of acids (the "mineral acids") due to its high toxicity. Waste carbon tetrachloride and chloroform were also generated. (Santarelli, p. 77-80).
- Industrial waste treatment plant sludge from the onsite plant was the product of treatment of the liquid waster, primarily acids, with treated effluent discharged to the sanitary sewer (Santarelli, p. 84).
- Western Electric had drummed materials transported off-site during the Period of Interest (Santarelli, p. 97);

Manufacturing Processes and Waste Generation – Reading Works

The Western Electric Reading Works was located at 2525 North 12th Street in Reading, PA during the Period of Interest. The Reading Works was part of the Electric Components Division, with manufactured products that included transistors, diodes, varistors, integrated circuits, electron tubes, and light-emitted diodes (1997 Lucent response to USEPA 104(e) request, AGER000062).

From 1969 through 1977, the Reading Plant reportedly generated the following types of waste (AGER00063):

- Flammable solvent (including acetone);
- Chlorinated solvents;
- Industrial waste treatment plant sludge;
- "J-100" photo-resist stripper;
- "Mixed chemicals" (unspecified)
- Waste acids (unspecified);
- Silicon lapping sludge; as well as
- General plant trash (wood, paper, glass, cans, food, construction/demolition-type debris).

A Western Electric document provided by Lucent, the May 24, 1971 Memorandum for Record regarding Mixed Solvents Drain indicates that non-flammable solvents included TCE, "Freons", methylene chloride and "cobehn" and flammable solvents included acetone, various alcohols, ethylene glycol, Stoddard solvent, amyl acetate, toluol, xylene, and methyl ethyl ketone (AGER000104).

Correspondence exists from 1973 regarding vacuum filter sludge generated at the Reading Works industrial waste treatment plant (Western Electric May 14, 1973 correspondence to PADER, BSAI031217 -8). At that time, Western Electric estimated that the sludge contained 1% chromium, and 0.1% heavy metals (Cu, Zn, etc.).

Waste Handling – Allentown and Reading

Both the Allentown and Reading Works created waste materials from activities related to photolithography, cleaning, degreasing and drying (AGER000063). Photolithography required the use of solvents as the carriers for various photoresists and for rinsing. Solvents were also used to degrease mechanical parts prior to installation, remove films from product surfaces, and to clean surfaces prior to subsequent steps in the manufacturing process (AGER000063). Each facility had an industrial waste treatment plant, used for neutralization and treatment of liquid wastes derived from etching, electroplating, silicon growing and deposition, and de-ionized water production/filtration processes prior to discharge to the sanitary sewer system. Each treatment plant generated a filter cake sludge material, reported to be largely inert material that included metals (unspecified) and "compounds" (AGER000063). Liquid waste treatment processes reportedly included acid/alkali neutralization, chrome reduction and cyanide destruction, prior to effluent discharge to sanitary sewer or stream (AGER000064).

At the Reading Works, the mixed chlorinated solvent wastes and flammable solvent wastes were separately disposed of by either containment in 55-gallon drums or by pouring into the mixed solvent drain or acetone drain. Mention is made of tanks that were periodically emptied by a waste hauler (AGER000063).

Copper sulfate and copper nitrate wastes generated at the Allentown plant were reportedly collected in plastic-lined 30-gallon drums, and waste treatment plant sludge was transported by truck (AGER000064).

Waste Generation Practices

Wastes, other than liquids discharged to sewer or stream from facility waste treatment plants as above, were reportedly removed by contractors (AGER000064). In Lucent's May 12, 1997 response to USEPA (AGER000065), Lucent indicates that, in the case of the Reading and Allentown plants, there were commercial relationships with haulers Marvin Jonas (Jonas Waste Removal Co.), Revere Chemical Co., Matlack, Revere, and Echo.

Allentown

Available documents clearly indicating Allentown as the generator list the following waste types generated at that facility:

- Acids;
- Misc. chemicals consisting of "nitric acid, nitric & hydrofluoric mix, photo resist, etc.";
- Waste etching acids;
- "Acids (HF, sulfuric, nitric)";
- "Photoresist Strippers (J-100, A-20)"

Reading

A January 29, 1979 analysis of waste quantities removed from the Reading Works during the period 1969 – 1978 exists (AGER000089 – 103), and includes a set of detailed monthly Waste Disposal Reports from March 1973 through March 1974. Those documents indicate the following waste types were generated at the Reading Works during 1969-1978 and disposed of by (unspecified) contractors:

- Miscellaneous trash or refuse;
- Sludge;
- Concentrated acid;
- Mixed solvents;
- Flammable solvents;
- Chlorinated solvents;

- Miscellaneous waste chemicals;
- Wood and construction rubble;
- “Air Brasive” or waste abrasive powder.

A February 1971 document (AGER000071 - 2) regarding the Reading Plant’s liquid wastes indicates that as of February 1971, the following wastes were being sent to contractors for “reprocessing”:

- Concentrated acids (70% nitric, 30% mixture of hydrochloric, hydrofluoric, sulfuric and acetic acids) reprocessed via neutralization and dumping of the salts at sea;
- Incineration of 20,920 gal/month of solvents (acetone and halogenated hydrocarbons);
- Spent copper cyanide plating liquor reprocessed via oxidation-reduction system, yielding gases and metals salts, with the metal salts “dumped in an approved manner”;
- Reprocessing of 100 lbs/month of miscellaneous hazardous chemicals (photo resists, stripping agents and a wide variety of laboratory reagents) “each according to its nature”; and
- 2250 pounds per month of silicon slicing and lapping sludge, “dumped” into a sanitary landfill.

A table (AGER000090) from Western Electric’s 104(e) submittal provides what are labeled as monthly quantities of waste, but does not identify the specific facility to which the information applies.

3.5.2 Western Electric Wastes Generated 1969-1977

Table V of this report provides a summary of documented waste volumes generated by Western Electric during the Period of Interest. A detailed summary of the available data, and calculations of actual reported/extrapolated total waste volumes generated, are provided in Appendix B, Tables 5a and 5b, respectively. Table 5a presents a summary of all available Western Electric waste disposal volume data (taken directly from the documents referenced), for the Allentown, Reading and North Carolina Works, during the Period of Interest.

Table 5b, Totaled/Extrapolated Waste Disposal Amounts, is based upon the raw data provided in Table 5a and presents calculated estimates of the total amount of each waste at each facility generated by year and over the Period of Interest (1970 through 1977, inclusive), for those waste types where sufficient data exist to allow reasonable estimates).

Information from Tables 5a and 5b is summarized in Table V, and discussed below:

- For the Reading Works, monthly totals from 1973 and 1974 can be used to determine the total amount of each waste type generated at a given facility during that 12-month period. That amount was assumed to represent an annual average, and was then multiplied by a factor of 8 to derive an extrapolated 8-year estimate of the total amount of each waste type generated. These estimates are available for the following waste streams known to contain hazardous substances: concentrated acid, flammable waste solvents, waste chlorinated solvents, as well as the rest of the named waste streams. An extrapolated total of 2,510,688 gallons of waste acids and solvents was calculated for the Period of Interest (Table V).
- Given that the only quantitative information for any waste stream at the North Carolina Works exists solely for the copper salts, an annual total and an 8-year extrapolated total could be calculated only for

copper salts wastes. Table V indicates an extrapolated 4,859,280 pounds of copper salts generated during the Period of Interest.

- Based on the limited quantitative information available for Allentown Works generated wastes, minimum and maximum annual and 8-year extrapolated totals could only be estimated for the flammable liquid waste, non-flammable solvents, and acids/miscellaneous chemicals waste streams. Both a minimum and a maximum volume for each of those three waste streams was estimated due to the existence of both reported actual annual amounts for 1969/1970 and Western Electric's own estimate of annual volumes generated:
 - From 280,000 to 640,000 gallons of flammable liquid waste;
 - From 192,000 to 440,000 gallons of non-flammable solvents (TCE); and
 - From 87,200 to 96,000 gallons of acids and miscellaneous chemicals.

4. Settled Defendants

4.1 Bostik South, Inc. (Crown Metro/Emhart)

Defendant Crown Metro, Inc. (Crown Metro) indicated in its 2003 information/document disclosure that the facility in question was located at Echelon Road, Donaldson Center, Greenville South Carolina. The facility was known as "Crown Metro, Inc." until February 26, 1976, when the company's name was changed from Crown-Metro, Inc. to "Bostik South, Inc." (Crown Metro, Inc., 2003). Apparently, Bostik South was at one point owned by Emhart Corporation, and was reportedly sold to Bengal Corporation (who later changed their name to Crown Metro, Inc.) in 1980 (EMHA00001).

4.1.1 Summary of Historical Operations

4.1.1.1 Manufacturing

Bostik South, Inc. was involved in the manufacture and sale of chemicals, colors, intermediates and reserovol (Crown Metro, 2003). A review of a series of shipping documents (specifically, for transporters Chemical Leaman and Matlock only, BSAI001866 – 2321) provided by Emhart (1988) in response to USEPA's June 10, 1988 information request provides some insights into both raw materials received by and products shipped from Bostik South's Greenville SC location during the period from December 1975 to November 1976.

Raw materials received by Bostik South:

- Methanol
- Mixed acid (33% nitric, 67% sulfuric);
- Formaldehyde;
- Para tetra butyl chlorobenzene;
- 1500 B acrylate;
- 1500 Sulfuric;
- Caustic;
- Nitrobenzene;
- "mix acid (nitric)";
- Glyoxyl;
- Nitrobenzol liquid;
- Oil of mirbane.

Product materials shipped from Bostik South:

- Textile/cotton softener
- Insecticide;
- Kyran cotton softener;
- "Weed or tree killing compound";
- Coal tar RVNX;
- Tyran.

No other details regarding manufacturing operations are currently available.

4.1.1.2 Waste Generation/Handling

The available file documents for Bostik South consistently indicate that spent acid waste was generated by Bostik South. A memorandum (BSAI012997-8) dated October 15, 1976, authored by a S. E. Bushman of an unidentified organization, indicates that "Bostick South, Inc. presently purchases 500 tons per year of mixed acid to product an organic intermediate, 2,4 dinitro-chlorobenzene ... intends to expand their business to 1000 tons per year are contingent to their finding an outlet for their nitration spent acid. The spent acid is permanently neutralized with lime and dumped, but Bostic [sic] is convinced that this ...handling by a scavenger do not represent acceptable long-term environmental solutions."

An undated "Master Sales Report" for Bostik South (BSAI012999) notes that "During 1976, ICD shipped 363 tons of Sulfan and 663 tons of Mixed Acid. ... Bostik currently generates a ton/day as a result of their Mixed Acid operation" and "...Bostik intends to sub-contract for the disposal of their waste or spent acid".

The 1976 Bushman memorandum provided the following composition information for Bostik's spent acid:

Total acidity is H ₂ SO ₄	86-90%
HNO ₃	1 – 5%
Nitrosyl	1 – 6%
Nitro-chlorobenzene compounds	1 – 3.5%

A USEPA memorandum concerning the "Revere Chemical" site, dated June 22, 1987, refers to Manfred DeRewal's practice of dumping wastes into the City of Philadelphia's sewers, and references calculations made by City officials of the volumes of wastes discharged by DeRewal into the City sewer system from August 1976 through March 24, 1978 (EMHA00014). Source companies and volumes were listed, among them "Bostik So." of "Greenville N.C." with a volume of 37,665 gallons of sulfuric acid (EMHA00015). No mention is made of how the City was able to calculate the total volume for each party.

In the deposition of Manfred DeRewal Jr., (2003), Mr. DeRewal recalls hauling "fresh" acid to Bostik in South Carolina, pumping the fresh acid into a tank onsite, and departing with a previously delivered tanker (originally empty) that was now full of (waste) "sulfuric nitric" acid, intended for disposal. Mr. DeRewal recalled hauling this waste on two or three occasions (M. DeRewal Jr., 2003, p. 116-118).

No other information regarding Bostik South's waste generation/transportation practices is currently available.

4.1.2 Bostik South Wastes Generated 1969-1977

Based on the information found in the limited documentation available, it is clear that, at a minimum, the Bostik South Greenville SC facility generated waste (spent) sulfuric/nitric acid during the mid-1970s. The information is not sufficient to allow an estimate of the total amount of waste(s) generated by Bostik South during the 1969-1977 timeframe. The 37,665 gallons of spent sulfuric acid reportedly calculated by the City of Philadelphia may represent the minimum amount generated, but the basis for that calculation is unknown. Due to the very limited nature of the available information regarding Bostik's generated waste types/volumes, no summary tables have been prepared for Bostik, Inc. at this time.

4.2 Ciba-Geigy (Novartis)

In a June 10, 1988 correspondence to Ciba-Geigy Corporation (Ciba-Geigy), USEPA reportedly stated that information exists indicating Ciba-Geigy's Cranston Rhode Island facility was a generator of hazardous substances disposed of or transported to Manfred DeRewal's facilities (BSAI004015). From 1969 – 1970, the former Ciba-Geigy Cranston, Rhode Island facility was owned by Geigy Chemical Corporation, which merged with CIBA Corporation in late 1970 to form Ciba-Geigy Corporation (BSAI026747).

4.2.1 Summary of Historical Operations

4.2.1.1 Manufacturing

The Ciba-Geigy Corporation Cranston Plant was primarily a batch manufacturing plant, which manufactured new products in commercial quantities. If sales of a new product required significantly increased production, the manufacture of that product was transferred to another Ciba-Geigy facility. The facility closed in 1986 (Novartis, 2003).

Ciba shipping documents dating from 1976 and 1977 reviewed by SEC indicated the purchase by and delivery to the Cranston RI facility of the following raw materials:

- Nitrosulfuric acid or sulfuric acid (the majority of the purchases);
- Cresol;
- Fatty alcohol;
- Nitrosulfuric acid;
- Hydrochloric acid;
- Ammo thiosulfate solution;
- Muriatic acid.

The limited documentation currently available to SEC does not contain any additional information regarding historical manufacturing activities at the Cranston RI facility.

4.2.1.2 Waste Generation/Handling

In the early to mid-1970s, the Cranston Plant reportedly developed a process to make the Ciba-Geigy product known as "Tolban". The Tolban manufacturing process utilized several intermediates, including one which used mixed acid for nitration. The nitration process used sulfuric acid and generated waste or "spent" sulfuric acid at the Cranston facility (Novartis, 2003).

The limited documentation currently available to SEC does not contain any additional information regarding historical waste generation at the Cranston RI facility.

4.2.2 Ciba-Geigy Wastes Generated 1969-1977

Table VI of this report provides a summary of documented waste volumes generated by Ciba-Geigy during the Period of Interest. A detailed summary of the available data, and calculations of actual reported/extrapolated total waste volumes generated, are provided in Appendix B, Tables 6a and 6b, respectively.

Ciba-Geigy, in response to USEPA information requests, provided a set of copies of waste and raw materials shipping documents related to the Cranston RI facility from 1976 through 1984. Of those documents, waste shipping information for 1977 and earlier was reviewed by SEC and summarized in Table 6a. For the two years with available data during the relevant timeframe (1976 and 1977) it is evident that the only documented waste material shipped off-site was spent sulfuric acid, with or without traces of nitric acid. A total of 66,767 pounds of spent sulfuric acid was hauled away for off-site disposal during the period from May 17, 1976 to November 3, 1977.

As summarized in Table VI, monthly and annual average waste generation amounts were calculated from the available 1976 and 1977 data, and were then applied to the remaining years of the Period of Interest to derive an extrapolated 8-year total of 728,239 gallons of spent sulfuric acid. Table 6b provides details regarding these calculations.

4.3 Knoll International, Inc. (Knoll)

The only documentation currently available to SEC regarding Knoll is a March 17, 2003 correspondence from Knoll's counsel, Richard H. Friedman, to Glenn Harris, Esq.

4.3.1 Summary of Historical Operations

Knoll's March 17, 2003 letter indicates that Knoll operated at five different buildings, four located in East Greenville PA and one located in Pennsburg, PA, during the years 1970 – 1977.

4.3.1.1 Manufacturing

Operations at the five buildings included: storage; furniture manufacturing/offices; and product development/design. No further information is provided.

4.3.1.2 Waste Generation/Handling

No information is currently available.

4.3.2 Knoll Wastes Generated 1969-1977

Information currently available to SEC regarding Knoll's volume of generated wastes is limited to DeRewal employee deposition testimony, as follows:

- DeRewal truck driver John Barsum recalled that he picked up and transported wastes (he did not know what kind) from Knoll's location in Pennsburg, PA, using a 4,000 gallon tanker, once per month for 8 or 9 months, starting in 1973 or 1974, possibly at the request of Jonas (J. Barsum, 2003, p. 94-100 and 215).
- Manfred DeRewal Jr. recalled three trips to Knoll's Pennsburg facility, to pick up a clear solution (liquid) bulk waste, 2,500 to 3,000 gallons average load volume, beginning in 1975 or 1976 (M. DeRewal Jr., 2003, p. 101, 107).
- Additionally, Manfred Jr. recalled using a rubber-lined tanker, that the wastes were therefore not nitrating (sulfuric/nitric) acids (Ibid, p. 338).

Based on the above information, one can calculate a range of 39,500 to 45,000 gallons of unknown liquid waste generated by Knoll during the early/mid-1970s. Due to the very limited nature of the available information regarding Knoll's generated waste types/volumes, no summary table has been prepared for Knoll, Inc. at this time.

4.4 Plymouth Tube Company

Plymouth Tube Company, a division of Van Pelt Corporation operated a facility called the Ellwood Ivins Plant in Horsham, Pennsylvania during the 1970s, (Hawk, 1977). No other information is currently available.

4.4.1 Summary of Historical Operations

4.4.1.1 Manufacturing

A 1971 application for an Industrial Wastes Permit from the Ellwood Ivins Tube Co. indicates that the facility's manufacturing activities involved production of stainless steel tubes "utilizing the cold drawing process" (BSAI032689). An attachment to the application describes the use of two process acid solutions at the mill: a 30% nitric acid solution, used infrequently to clean "particularly dirty raw stock"; and a mix of nitric and hydrofluoric acids at concentrations of "roughly 6% to 10% each". The tubing was handled in bundles totaling approximately 2000 linear feet per bundle. Peak productivity (at least in 1971) was noted to be 24 bundles per shift, with an expansion to a two-shift operation anticipated (BSAI032690).

No other information was available to SEC during the preparation of this report to provide any further details regarding Plymouth Tube's manufacturing operations during the 1970s.

4.4.1.2 Waste Generation/Handling

The 1971 permit application describes a proposed waste treatment process involving a double rinsing of acid treated tubes in non-flowing rise tanks. The "pickled" tube bundles would be drained over the acid tanks, separately rinsed in each of two "Still Tanks", followed by two running rinses (BSAI032690). As proposed in the permit application, spent acids (the spent nitric-hydrofluoric acid bath) and the liquid from the first still rinse tank were to be hauled from the facility by a contractor. Liquid from the second still rinse would be used as dilution water for preparation of the acid bath (BSAI032691). The running rinse waters, together with furnace cooling water, would be discharged at a rate of 20 gpm into Park Creek (BSAI032692).

The 1971 permit application also indicates the following volumes of discharges (BSAI032687):

- 1,000 gallons per day into "surface containment";
- 100 gallons per day to "underground disposal"; and
- 230 gallons per day to "waste acceptance firms".

Hugh Hawk (1977), General Manager of Plymouth Tube in 1977, indicates in correspondence to PADER that Plymouth Tube disposed of hazardous waste spent pickle liquor during the period from 1972 to 1977 (BSAI000361). Mr. Hawk indicated that this waste was generated each year from 1972 to 1976, with 16 loads in 1972, reduced each year to a minimum of 5 loads by 1976, with none generated yet in 1977. Each load was normally only 700 or 800 gallons of actual volume, although Plymouth paid for 3,000 gallons.

The composition of the waste material was reported by Hawk (1977) as 5% hydrofluoric acid, 11% nitric acid, and 84% water (BSAI000361).

Table 7 in Appendix B contains a summary of data from available historical documents related to Plymouth Tube's wastes. Available waste shipping documentation indicates a total of 28,000 gallons of "waste acid" removed from the Plymouth Tube Co. Horsham PA facility during the period from June to November 1967. Taken as a whole, the documents indicate that Plymouth Tube generated waste acid and hired a waste hauler to dispose of at least 28,000 gallons of the waste during 1976.

4.4.2 Plymouth Tube Waste Volume Generated 1969-1977

An estimate range of total waste volumes generated during the Period of Interest can be calculated two different ways, depending on which of the two available data sources (Hawk, 1977 or the 1971 permit application) is utilized. If the following assumptions, based on the Hawk 1977 letter, are made:

- The spent hydrofluoric/nitric acid mixture is the only known waste generated and transported off-site;
- Each waste load was an average of 750 gallons;
- The maximum number of loads per year was 16, and the minimum number of loads was 5, and it is known that 16 loads were generated in 1972 and 5 loads were generated in 1976;
- The waste generation occurred over a period of 5 years: 1972 through 1976.

A range of volumes of spent acid waste generated can be calculated from the Hawk (1977) information as follows:

- The maximum calculated volume of spent acid generated was $69 \text{ loads} \times 750 \text{ gallons/load} = 51,750$ gallons; and
- The minimum calculated volume of spent acid was $36 \text{ loads} \times 750 \text{ gallons/load} = 27,000$ gallons.

However, the available shipping records (Table 7, Appendix B) indicate a minimum of 7 loads shipped from the Horsham facility during June through November 1976 (and there is no information available to suggest the records are complete), conflicting with the Hawk (1977) report of 5 loads generated in 1976.

Utilizing the 1971 permit application figure of 230 gallons per day of waste generated and hauled offsite by contractors, and assuming the five-year period 1972-1976, 260 days/year (52 weeks x 5 working days/week), a total waste amount of 59,800 gallons per year, or 299,000 gallons over five years, can be calculated.

As summarized in Table VII, based on currently available data sources, one can calculate an estimated volume ranging from 28,000 to 299,000 gallons of total spent acid waste generated by Plymouth Tube/Ellwood Ivins during 1972 – 1976.

4.5 Quikline Design & Manufacturing

During the period 1970 – 1977, Quikline Design & Mfg. Co. (Quikline) was located at 1 Fellowship Road, Cherry Hill, New Jersey (Schmidt, 2003). In 1985, Mr. Vinu Patel, along with others, purchased the stock of Quikline, and later relocated the company to Gloucester City, NJ (McAndrew, 1996).

4.5.1 Summary of Historical Operations

4.5.1.1 Manufacturing

Quikline reportedly manufactured printed circuit boards during the period 1970 – 1977 (Schmidt, 2003). No other information regarding Quikline's manufacturing operations was available for SEC's review.

4.5.1.2 Waste Generation/Handling

Available information regarding Quikline's waste generation and handling practices is limited to the following:

- A March 1973 correspondence from Manfred T. DeRewal to Quikline quoting a unit price for transport and disposal of waste etchant in 15-gallon carboys (BSAI016524);
- Manfred DeRewal Jr.'s deposition testimony (2003) recalling hauling Quikline's waste chromic acid and mineral spirits in 15-gallon carboys and/or 55-gallon drums, on four to eight occasions (M. DeRewal Jr, 2003, pp. 123-126, 361); and
- A DeRewal Chemical Company invoice to "Quikline Design Inc." in Cherry Hill NJ, dating from 1973, indicating removal of 35 drums of waste chromic acid (BSAI032908).

4.5.2 Quikline Wastes Generated 1969-1977

Based upon the limited available information, and assuming a 55-gallon volume per drum, the minimum amount of waste generated by Quikline during the 1970s can be calculated as 1,925 gallons of waste chromic acid. Due to the very limited nature of the available information regarding Quikline's generated waste types/volumes, no summary tables have been prepared for Quikline at this time.

4.6 Rohm & Haas Company

The only information relevant to Rohm & Haas Company available for SEC's review consisted of Rohm & Haas' initial disclosure pursuant to the February 3, 2003 Case Management Order in the BFAG v. AETC matter. The disclosure indicates that Rohm & Haas did not receive a CERCLA Section 104(e) request in connection with the Boarhead Farms site.

The Rohm & Haas (R & H) "Philadelphia Plant" is located in the Bridesburg section of Philadelphia at 5000 Richmond Street, Philadelphia, PA (Rohm & Haas, 2003).

4.6.1 Summary of Historical Operations

4.6.1.1 Manufacturing

During the relevant time period (1970 through 1977) R & H Philadelphia reportedly produced specialty chemicals, including ion exchange resins and herbicides (Ibid).

4.6.1.2 Waste Generation/Handling

The only information regarding waste generation by R & H Bridesburg plant currently available to SEC comes from various depositions, including:

- Marvin Jonas (1986) recalled hauling methanol solvent, unspecified waste solvents, waste latex from unspecified R & H plants (p. 5), and hauling solvents, still bottoms, acetone, press papers from the Bridesburg plant (pp 35-44);
- DeRewal employee John Barsum recalled hauling hydrochloric acid from the R & H facility near the Burlington-Bristol Bridge (Barsum, 2003, p. 175-178);
- Manfred DeRewal Sr. recalled hauling acrylic latex, and "Seven" insecticide in fiber packs from R & H (M. DeRewal Sr., 2003, p. 199-202); and
- DeRewal employee Jeffrey Shaak recalled hauling R & H drummed wastes (type not specified) (J. Shaak, 2003, p. 90-92);

4.6.2 Rohm & Haas Wastes Generated 1969-1977

The information/data currently available at the time of preparation of this report were insufficient, in my opinion, to allow any estimate of the volume(s) of wastes generated by R & H during the Period of Interest. Due to the very limited nature of the available information regarding R & H's generated waste types/volumes, no summary tables have been prepared for R & H at this time.

4.7 Simon Wrecking

Simon Wrecking Co. was located at 2525 Trenton Avenue, Williamsport, Pennsylvania (Morgan, 2003).

4.7.1 Summary of Historical Operations

4.7.1.1 Manufacturing

No information regarding Simon Wrecking's operations was available to SEC at the time of report preparation.

4.7.1.2 Waste Generation/Handling

Information currently available to SEC related to wastes generated by Simon Wrecking during the timeframe of interest is limited to the following:

- A handwritten quote for disposal of liquid wastes and bulk acid solution (BH0003959/BSAI016578) from Simon Wrecking;
- The recollections of former DeRewal employee Manfred DeRewall Jr. (2003, p. 160, 424, 428) of picking up drums at Simon Wrecking, and the drums being a distinctive "coned" shape at top/bottom and red in color; and
- A handwritten ledger page from Jonas, entitled "Simon Wrecking Co., Williamsport", indicating pickup and disposal of solvents, paint sludge, waste oil, and waste acid during the months of June and July in an unspecified year. It is assumed that this page dates from the 1970s, as surrounding pages are dated between 1973 and 1979.

4.7.2 Simon Wrecking Wastes Generated 1969-1977

The single Jonas ledger page described above constitutes the only quantitative information related to wastes generated by Simon Wrecking during the 1970s currently available to the preparation of this report. The detailed information is tabulated in Table 8 (Appendix B) and a summary is provided in Table VIII. Dates represented in the ledger page appear to represent a maximum of two month's worth of information. Because Simon Wrecking's years of operation are currently unknown, extrapolation across the 8-year Period of Interest was not performed. The total of 178,000 gallons (combined) of paint sludge, solvents, waste acid and waste oil, is therefore considered to represent a minimum volume of wastes generated by Simon Wrecking during the 1970s.

4.8 Sperry/Burroughs (Unisys)

Unisys Corporation (Unisys) was formerly Burroughs Corporation and is the successor by merger to Sperry Corporation. Sperry-Univac was a division of Sperry Corporation (UNIS -0002). Information currently available to SEC related to Sperry's historical manufacturing processes and waste generation practices consists of the very limited information provided by Unisys to USEPA in 1988 and 1992 104(e) responses.

4.8.1 Summary of Historical Operations

The former Sperry-Univac facility was located at 411 Turner Street in Utica, NY from 1969 through 1975. In 1975, the Utica facility's plating line was sold to a former employee, who began a company named Empire Circuits and manufactured circuit boards. The entire Sperry-Univac Utica facility was reportedly vacated in 1977 (UNIS-0004).

Unisys also apparently operates or operated facilities in Blue Bell PA and Paoli PA (BASI001850). The Blue Bell facility was owned by Sperry Corporation and later by Unisys Corporation (BASI001848). The Paoli facility was owned by Burroughs Corporation and later by Unisys Corporation.

4.8.1.1 Manufacturing

In a 1992 correspondence, Unisys reported to USEPA that the former Sperry-Univac facility in Utica, NY produced computers and other data processing equipment (such as computers, key punchers, card readers, printers, printed circuit boards and tabulating equipment). The Utica facility also reportedly contained a plating line (UNIS-0004). Unisys indicated that the processes used to produce the aforementioned electronic equipment were "typical of those widely used in the industry and in the manufacturing of printed circuit boards."

4.8.1.2 Waste Generation/Handling

Based on a general knowledge of the processes used to produce the electronic equipment mention above, Unisys surmised that Sperry-Univac may have generated the following wastes (UNIS-0004):

- Machine tool and cutting lubricants;
- Etchants;
- Anodizing/plating solutions;
- Degreasing and cleaning solvents;
- Photo-resistant development and stripping solvents;
- Solder dross and flux;
- Paint sludge/solids;
- Miscellaneous laboratory chemicals;
- Precious metal reclamation solvents;
- Foundry sand/slag;
- Heat-treating solids;
- De-smearing/cleaning acids.

Unisys did not provide further details, and claimed to have no further information regarding waste generation practices at the former Sperry-Univac facility.

4.8.2 Unisys Wastes Generated 1969-1977

The limited documentation available regarding industrial waste from a Unisys facility indicates generation of the following wastes:

- Removal of 63 drums of "industrial waste" from the Univac Utica NY facility in 1972 (UNIS-0015);
- Three 50 gallon drums of cyanide transported from the Univac Blue Bell PA location in 1973 (UNIS-0012) (the document was illegible with regard to drum volume); and
- Liquid Toner (flash point 106° F) "a petroleum distillate similar to kerosene" in 30-gallon drums, from the Univac Blue Bell PA facility (purchase order only, unit costs specified) (BH0003965).

Those data are listed in Table 9 (Appendix B), and summarized in Table VIII as totaling 3,615 gallons, but are considered too limited, in my opinion, to permit an estimate or extrapolation of monthly/annual waste volumes generated.

4.9 United States Dept. of the Navy

The only document related to the U.S. Navy facility in Warminster, PA, available to SEC at the time of this report's preparation is the United States' March 19, 2003 filing pursuant to Paragraph 3.B(3) of the Case Management Order in the matter of BFAG v. AETC (Sansonetti, 2003).

4.9.1 Summary of Historical Operations

The United States Naval Air Development Center (NADC) was a 734-acre facility located in Warminster Township, Bucks County, PA. According to the 2003 pleading (Sansonetti, 2003), the main mission of NADC during the period 1970 to 1977 was to conduct research, development, testing, and evaluation for Naval aircraft systems, including flight controls systems, ejection devices, and other key aircraft mechanisms. NADC also conducted studies in anti-submarine warfare systems and software development (Ibid).

4.9.1.1 Manufacturing

No information regarding manufacturing activities at the NADC is currently available.

4.9.1.2 Waste Generation/Handling

No information regarding waste generation activities by NADC is currently available, with the exception of the following former DeRewal employee deposition testimonies:

- J. Barsum (2003, p. 147-151) recalled performing two waste pickups at the "Johnsville Air Base", less than 20 drums each time: 8 to 10 drums the first trip, 6 or 7 drums the second trip;
- M. DeRewal Jr. (2003, p. 107-110) recalls picking up drums from the Naval facility off of Street Road on two or three occasions. The wastes were contained in 5 to 55-gallon containers, some may have been "cardboard packed", possibly 10 to 20 drums.

4.9.2 US Navy Wastes Generated 1969-1977

Information made available to date to SEC is insufficient, in my opinion, to permit identification of waste types and any estimate of total quantities generated by the NADC facility during the 1970s. Due to the very limited nature of the available information regarding the US Navy's generated waste types/volumes, no summary table has been prepared for the US Navy at this time.

5. Opinions and Conclusions

I have reviewed and summarized available information related to each of the fourteen Plaintiff and Settled Defendants' manufacturing processes, along with the volume, form and nature of the resulting wastes generated by those processes. The opinions and conclusions that I have reached are presented herein. The objective is to identify, to the extent the available records will permit, the nature and quantity of wastes that were generated by each Plaintiff and Settled Defendant during the period of time that Boarhead Farms operated (1969 to 1977, rounded to 8 years duration). SEC has not been asked to make findings or form opinions as to whether wastes generated by any Plaintiff or Settled Defendants were disposed at Boarhead Farms.

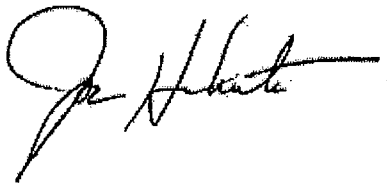
In order to determine or estimate/extrapolate the quantity of waste substances generated by each of the Plaintiffs and Settled Defendants, all available historical documentation was reviewed and summarized in tabulated format when actual quantities were available. All waste types were considered and all information taken at "face value". Totals of each waste type generated for each year of the Period of Interest, were calculated using the most complete data set available. SEC was not provided with a complete inventory of waste generation for any of the Plaintiffs or Settled Defendants for the Period of Interest. When there was sufficient indication in the available record that the facility and its waste generating activities took place during a portion or all of the Period of Interest, data were extrapolated accordingly. Extrapolation was performed when multiple pieces of information were available.

Sections 3.0 and 4.0 and associated tables (including tables in Appendix B) provide a detailed accounting of the quantities and types of wastes generated by each of the 14 companies. The following summarizes SEC's tabulation of actual and/or extrapolated quantities of wastes produced during the Period of Interest by each of the following Plaintiffs and Settled Defendants. For:

1. **American Cyanamid:** Actual (and incompletely documented) wastes generated totaled 10,546,745 gallons (based on Jonas records). Extrapolated quantities of waste generated during the Period of Interest totaled 14,921,473 gallons (based on Jonas ledger information);
2. **National Rolling Mills:** Actual (and incompletely documented) wastes generated totaled 661,100 gallons. Extrapolated quantities of waste generated during the Period of Interest totaled 1,959,533 gallons;
3. **Philco Ford:** Actual (and incompletely documented) wastes totaled 708 55-gallon drums of waste materials. Information made available to date to SEC is insufficient, in my opinion, to permit identification of waste types and any extrapolated estimate of total quantities generated;
4. **Standard Pressed Steel:** Actual (and incompletely documented) wastes generated totaled 134,080 gallons. Extrapolated quantities of waste generated during the Period of Interest totaled 1,236,088 gallons;
5. **Western Electric:** For the Reading facility - actual (and incompletely documented) wastes generated totaled 313,836 gallons and 1,828,197 pounds. Extrapolated quantities of waste generated during the Period of Interest totaled 2,510,688 gallons and 14,625,576 pounds. For the North Carolina facility - actual (and incompletely documented) wastes generated totaled 101,235 pounds, and extrapolated quantities of waste were 4,859,280 pounds. For the Allentown facility - actual (and incompletely

documented) wastes generated totaled 111,800 gallons, and extrapolated quantities of waste ranged from 807,200 to 928,000 gallons;

6. **Bostik South:** Actual (and incompletely documented) wastes generated totaled 37,665 gallons (considered a minimum amount). Information made available to date to SEC is insufficient, in my opinion, to permit identification of all waste types and any estimate of total quantities generated by the Bostik facility during the 1970s;
7. **Ciba-Geigy:** Actual (and incompletely documented) wastes generated totaled 69,367 gallons. Extrapolated quantities of waste generated during the Period of Interest totaled 728,239 gallons;
8. **Knoll International, Inc.:** Based solely on deposition testimony, a range of 39,500 to 45,000 gallons of unknown liquid waste can be estimated;
9. **Plymouth Tube Company:** Actual (and incompletely documented) wastes generated totaled 28,000 gallons. Estimated total quantities of waste generated during the Period of Interest ranged from 28,000 to an extrapolated 299,000 gallons;
10. **Quikline Design and Manufacturing Company:** Actual (and incompletely documented) wastes generated totaled 1,925 gallons. Information made available to date to SEC is insufficient, in my opinion, to permit identification of all waste types and any estimate of total quantities generated by the Quikline facility during the 1970s;
11. **Rohm & Haas Company:** Information made available to date to SEC is insufficient, in my opinion, to permit identification of all waste types and any estimate of total quantities generated by the Rohm & Haas facility during the 1970s;
12. **Simon Wrecking:** Actual (and incompletely documented) wastes generated totaled 178,000 gallons. Information made available to date to SEC is insufficient, in my opinion, to permit identification of all waste types and any estimate of total quantities generated by the Simon Wrecking facility during the 1970s;
13. **Sperry/Burroughs:** Actual (and incompletely documented) wastes generated totaled 3,615 gallons. Information made available to date to SEC is insufficient, in my opinion, to permit identification of all waste types and any estimate of total quantities generated by the Sperry facility during the 1970s;
14. **United States Department of the Navy:** Information made available to date to SEC is insufficient, in my opinion, to permit identification of waste types and any estimate of total quantities generated by the NADC facility during the 1970s.



Joseph J. Hochreiter

September 29, 2006

6. List of Documents Considered

(Bates numbers are provided as available)

Documents Related to Plaintiffs:

American Cyanamid:

American Cyanamid, 1976. Series of shipping documents from the Bound Brook NJ facility (Bates numbered BQ0104-150), indicating Jonas Waste Removal of Sewell NJ as hauler.

American Cyanamid Company, 1988. Response to USEPA June 10, 1988 correspondence. July 13, 1988.

American Cyanamid Company, 1993. Response to USEPA May 26, 1993 correspondence. Includes attachments. July 2, 1993.

Bailey, Robert E., 1990. Oral Deposition in the matter of United States of America v. Helen Kramer, et. al., Civil Action No. 89-4380. August 14, 1990. Includes Exhibit Bailey-3.

Cytec, 1994. Response to USEPA March 11, 1994 correspondence. Includes attachments. April 28, 1994.

Frankel, Sydney A., 1991. Oral Deposition in the matter of United States of America v. Helen Kramer et. al., Civil Action Nos. 89-4340, 89-4380. February 27, 1991.

Frankel, Sydney A. 1994. Statement and transcript of September 28, 1993 Interview with Sidney A. Frankel. January 3, 1994.

Frankel, Sydney A., 2005. Oral Deposition in the matter of Boarhead Farms Agreement Group v. AETC et. al., Civil Action No. 02-3830. January 24, 2005.

Jerome, Joel, 2005. Oral Deposition in the matter of Boarhead Farms Agreement Group V. AETC et. al., Civil Action No. 02-CV-3830. January 6, 2005.

Jonas, 1972. Application for Certification to Collect or Haul Solid Waste (Exhibit Jonas 20, 6-22-95).

Jonas, 1974. Registration Statement for a Solid/Liquid Waste Collector or Hauler.

Jonas, 1975. Registration Statement for a Solid/Liquid Waste Collector or Hauler.

Jonas, Inc. 1975. Correspondence to NJDEP re coding of materials, landfills and recycling plants. February 18, 1975 (labeled as Exhibit Jonas 14, 6/21/1995).

Jonas 3-ring binder ledger pages, 1976-1979, Bates # 00000020-00000050.

Jonas, Marvin. 1995. Deposition in the matter of Anthony F. Incollingo et al. v. RCA Corp. et. al., Civil Action No. 87-4263. June 18, 20, 1995.

USEPA, 2006. American Cyanamid, New Jersey, EPA ID#: NJD002173276, Site Details. March 21, 2006.

National Rolling Mills:

Boarhead Farms Agreement Group, undated. Initial Disclosures, for TI Group Automotive Systems, in the matter of BFAG v. AETC, Civil Action #02-CV-3830.

Capone, Louis A. 1993. Interview/Statement, conducted by R. Grabill of CDM. September 27, 1993.

Chesky, Frederick. 1994. Interview/Statement, conducted by R. Grabill of CDM. March 1, 1994.

Civitello, Michael J. 1993. . Interview/Statement, conducted by R. Grabill of CDM. August 10, 1993.

Civitello, Michael J. 2004. Deposition in Boarhead Farms Agreement Group vs. Advanced Environmental Technology Corporation et. al., Civil Action No. 02-CV-3830. December 8, 2004.

Freda, Peter G., 1993. Interview/Statement, conducted by R. Grabill of CDM. August 10, 1993.

Freda, Peter G., 2004. Deposition in Boarhead Farms Agreement Group vs. Advanced Environmental Technology Corporation et. al., Civil Action No. 02-CV-3830. December 8, 2004.

Civitello, Michael J., 1993. Interview/Statement, conducted by R. Grabill of CDM. August 10, 1993.

Jonas ledger page entitled "National Rolling Mills, Paoli PA", 1976, no Bates #, included with materials labeled from a file "Boarhead Farms Superfund Site, 011938.074694, Jones 3-Ring Binder Pages Used by EPA, Redwell #24".

Piotti, Fred Sr. 2005. Deposition in Boarhead Farms Agreement Group vs. Advanced Environmental Technology Corporation et. al., Civil Action No. 02-CV-3830. January 13, 2005.

Piotti, Lawrence R., 1994. . Interview/Statement, conducted by R. Grabill of CDM. March 2, 1994.

Quici, Santo F. 1993. Interview/Statement, conducted by R. Grabill of CDM. August 10, 1993.

Quici, Santo F. 2004. Deposition in Boarhead Farms Agreement Group vs. Advanced Environmental Technology Corporation et. al., Civil Action No. 02-CV-3830. December 12, 2004.

Series of National Rolling Mills bills of lading, from 1975 (no Bates #s).

Winters, Merle, 1993. Interview/Statement, conducted by R. Grabill of CDM. September 16, 1993.

Winters, Merle, 2004. Deposition in Boarhead Farms Agreement Group vs. Advanced Environmental Technology Corporation et. al., Civil Action No. 02-CV-3830. December 3, 2004.

Philco- Ford:

Ford Motor Company, 1992. Response to USEPA's September 30, 1992 request for information. FORD000014-21.

Ford Motor Company, 1994. Response to USEPA April 12, 1994 request for information. June 14, 1994. Attachments. BSAI000137 – 493.

Ford Motor Company, 1996. Response to USEPA November 28, 1995 Information Request. January 31, 1996. FORD000518-524.

USEPA, 1992. Information Request Letter to Ford Motor Company, re Boarhead Farms Site. September 30, 1992. With enclosures. FORD000001-13.

USEPA, 1994a. Memo to File, Subject Boarhead Farms – Philco Ford Waste. March 30, 1994. BSAI005378-80.

USEPA, 1994b. Information request letter to Ford Motor Company, re Boarhead Farms Site. April 12, 1994. With enclosures. FORD000022 -135.

USEPA, 1995. Information request letter to Ford Motor Company, re Boarhead Farms Site. November 28, 1995. FORD000495-516.

Standard Pressed Steel:

Shea, Dennis, 2005. Oral Deposition in Boarhead Farms Agreement Group vs. Advanced Environmental Technology Corporation et. al., Civil Action No. 02-CV-3830. February 9, 2005.

SPS Technologies, 1988. Response to USEPA June 10, 1988 letter request. June 23, 1988. SPST00001-SPST00088.

SPS Technologies, 1992. Response to USEPA September 30, 1992 letter request. November 3, 1992. SPST00089-SPST00176.

SPS Technologies, 1996. Response to USEPA November 5, 1995 letter request. February 5, 1996. SPST00177 – SPST00396.

Stewart, David, 2000. Deposition in Luis Silva and Iolanda Silva v. Arco Petroleum Products et.al. January 6, 2000.

Stewart, David, 2005. Deposition in Boarhead Farms Agreement Group vs. Advanced Environmental Technology Corporation et. al., Civil Action No. 02-CV-3830. January 10, 2005. With Exhibits 1 through 14.

USEPA, 1992. Letter to Standard Pressed Steel Technologies, with attachments. September 30, 1992. BSAI035101 – BSAI035108.

USEPA, 1995. Letter to Standard Pressed Steel Technologies, with attachments. November 8, 1995. BSAI035084 – BSAI035094.

Western Electric:

AT&T, 1988. Correspondence to Ms. Suzanne Billings, USEPA, re Boarhead Farms Site. June 23, 1988. AGER000001 – 000005.

AT&T Technology Systems, June 15, 1987. Internal Memo from C.L. Fraust, Re: Jonas Waste Removal, with attachments. BSAI31233-49.

Initial Disclosures, BOARHEAD FARM AGREEMENT GROUP plaintiff v. ADVANCED ENVIRONMENTAL TECHNOLOGY CORPORATON ET AL., Defendants, Civil Action 02-CV-3820, Judge